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The Vascular Flora of Western Isle of Wight County, Virginia

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THE VASCULAR FLORA OF WESTERN ISLE OF WIGHT COUNTY, VIRGINIA

A Thesis

Presented to

The Faculty of the Department of Biology

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In Partial Fulfillment

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Master of Arts

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by

Gregory Michael Plunkett

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APPROVAL SHEET

This thesis is submitted in partial fulfillment of

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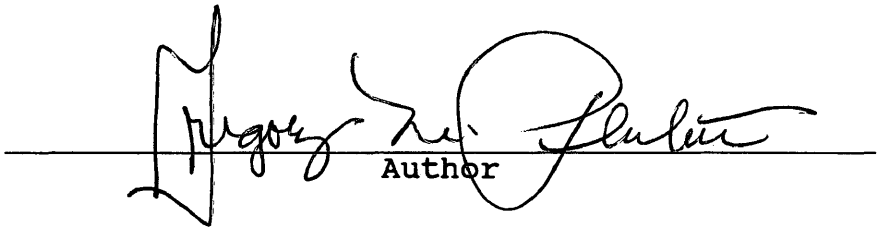

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Approved, July 1990

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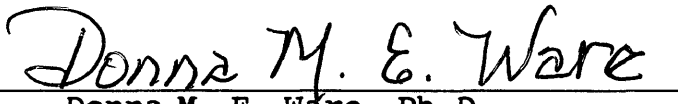
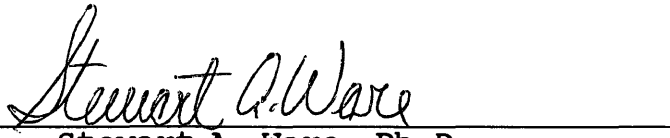


Donna M. E. Ware, Ph.D.



Stewart A. Ware, Ph.D.

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GLORIFICEMVR DEVS

and

for John and Patricia

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ABSTRACT

A floristic study was carried out in a fifty square mile area of western Isle of Wight County. Located on the southeastern coastal plain of Virginia, the county is bounded by Southampton County to the west, Surry County and the James River to the north, and the City of Suffolk to the south and east. The study area lies on the broad flat Isle of Wight Plain along the southward-flowing Blackwater River. The region tends to be characterized by a more southern flora and vegetation than areas only slightly to the north. Total topographic relief for the area is only 70 feet.

Forty-two trips were made to the study area in the growing seasons between March 1989 and June 1990. Habitats examined included pine sand hill communities, successional pinelands, beech-rich uplands, small stream bottoms, and swamps dominated by black gum, water tupelo and bald cypress, as well as various disturbed habitats. Vegetational analysis of representative forest types in the area was completed using the Bitterlich sampling method.

Six hundred and three species representing 356 genera of 113 families of vascular plants were documented from western Isle of Wight County during this study. Eighty-four of these are newly recorded for the county, and three of these are records for the southeastern coastal plain of Virginia. Eleven of the species encountered have been previously determined to be extremely rare or very rare in the state.

THE VASCULAR FLORA OF

WESTERN ISLE OF WIGHT COUNTY, VIRGINIA

INTRODUCTION

Isle of Wight County is located on the Atlantic Coastal Plain on the south bank of the James River, the major tributary of the Chesapeake Bay in southeastern Virginia. Bounded by Surry County and the James River on the north, Southampton County on the west, and the City of Suffolk to the east (Fig. 1), Isle of Wight is among those southside counties which support a distinctively southern flora, more like that of North Carolina than the rest of Virginia (Braun, 1950; Ware, et al., in press; Frost & Musselman, 1987). Isle of Wight's entire western border is formed by the Blackwater River. While its headwaters lie close to the James, the Blackwater flows south to its confluence with the Nottaway River at the North Carolina state line, forming the Chowan River which empties into Albemarle Sound.

The study area, approximately 50 square miles, lies primarily along the eastern side of the Blackwater (Fig. 2). The following series of roads and county lines were set as the limits of the area: from the State Route (SR) 619 Bridge over the Blackwater, north along the river until its northern limit in Isle of Wight, northeast along the Surry County line to SR 626, southeast to SR 621, southwest to SR 680, southeast to SR 652,

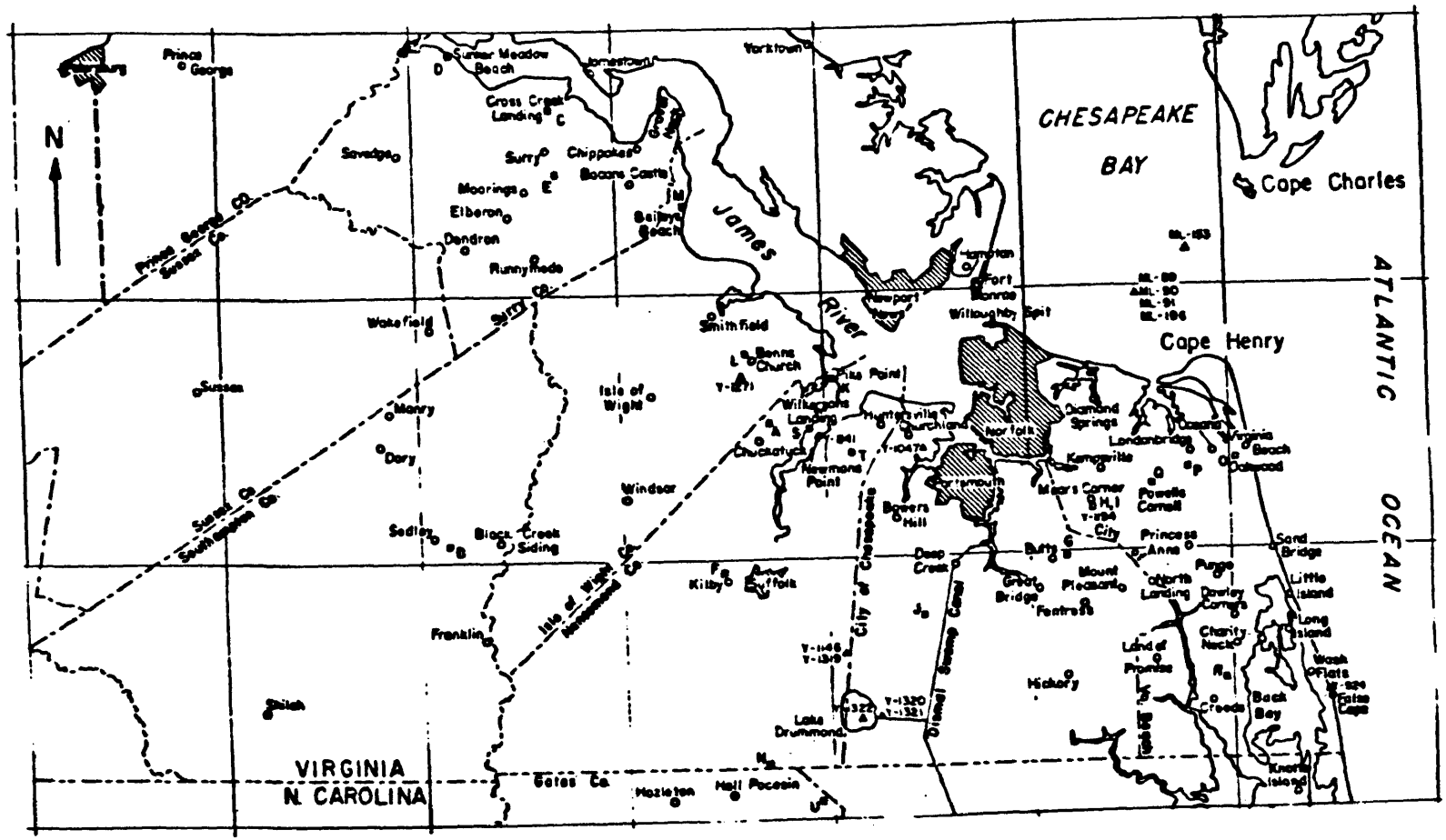

FIG 1: Map of southeastern Virginia showing county lines and locations of major towns and cities. (Oaks et al., 1974, p.55.)

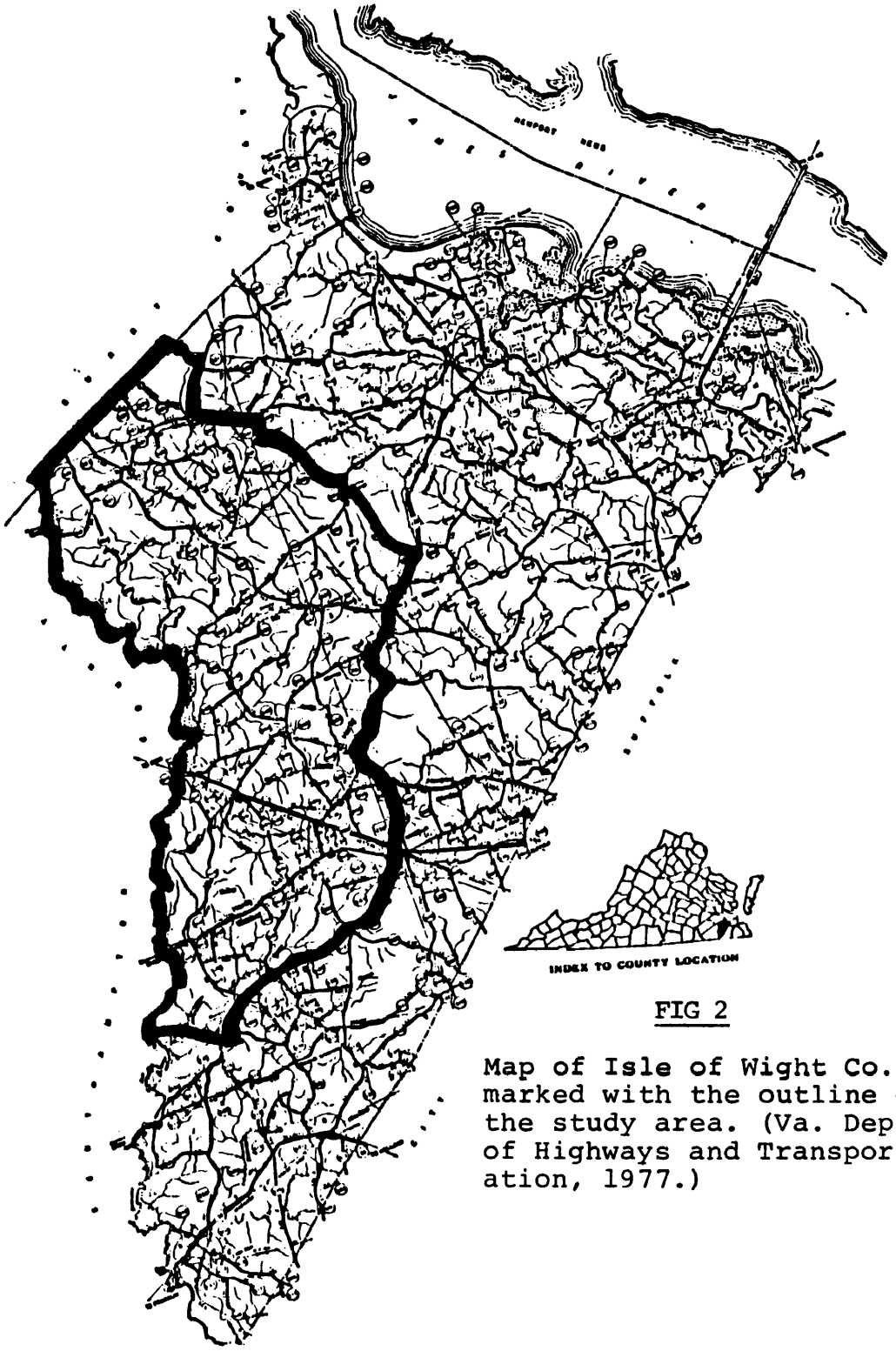

FIG 2

Map of Isle of Wight Co., marked with the outline of the study area. (Va. Dept. of Highways and Transportation, 1977.)

southeast to U.S. Route 258, southwest to SR 619, and thence back to the river (Fig. 3). Since an extensive floristic and vegetational study of the Zuni Pine Barrens has already been completed, that area has not been re-examined. Several of the major swamp systems studied included Carrowaugh, Horse, Antioch, Popes, Rattlesnake, and Pouches Swamps, which are all tributary to the Blackwater (Fig. 3). Towns within the study area include Raynor, Central Hill, Isle of Wight Court House (in part), Zuni, Windsor (in part) and Walters (in part).

The area is heavily agricultural, and crops include corn, soybeans, and peanuts. Livestock forms an important part of the local economy as well, especially small pig farming to supply pork for Smithfield hams. Industry is centered around the processing of agricultural products, and clear-cut logging. (Kitchel, et al., 1986.)

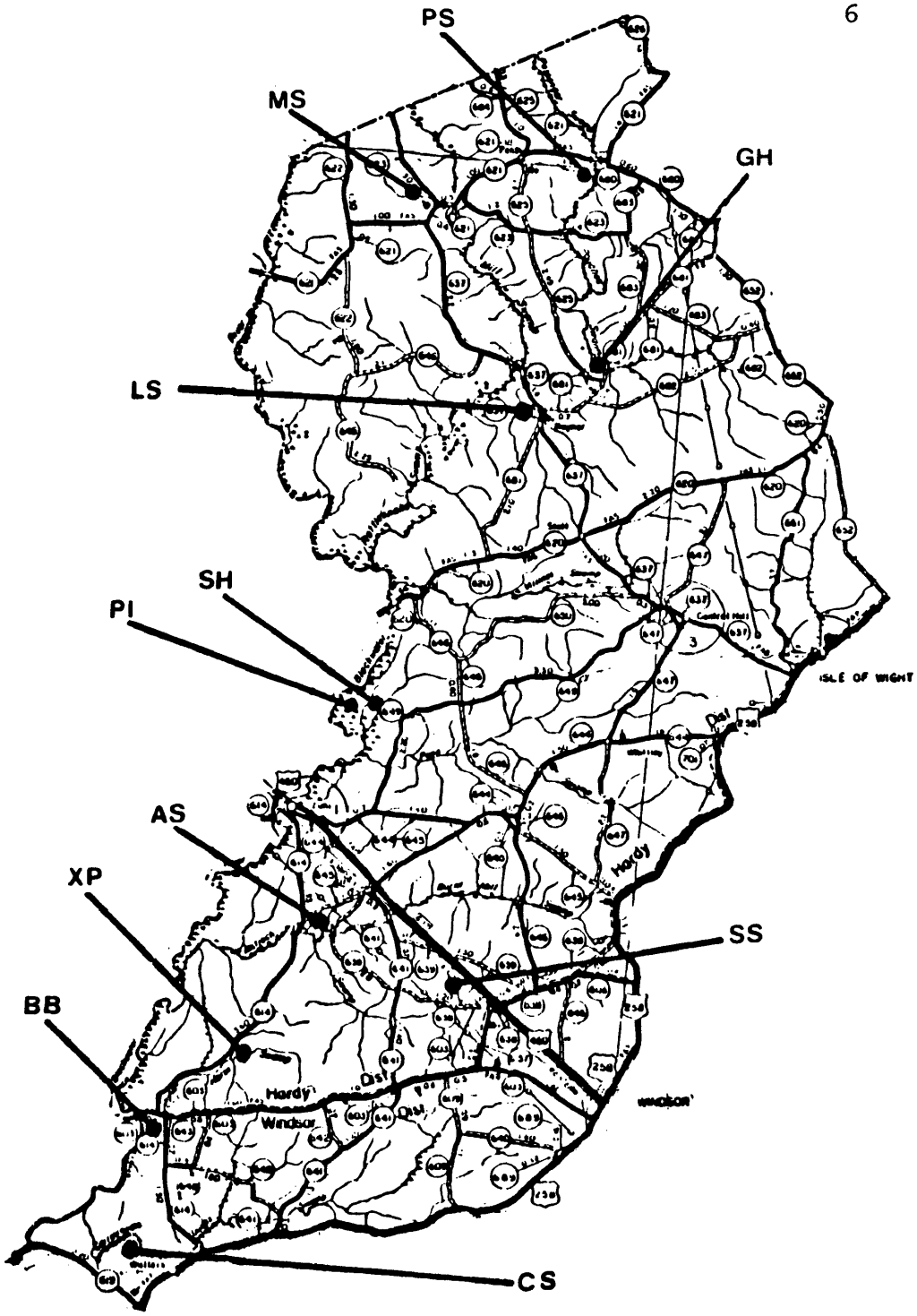

FIG. 3: Map of study area indicating locations of vegetational sampling. (Adapted from Va. Dept. of Highways and Transportation, 1977.)

HISTORY

General

The Isle of Wight area was originally home to the Worrosquoyacke Indians. The first visit of Europeans to the area occurred in 1608, by Captain John Smith, leader of the Jamestown Settlement (Morrison, 1907). Commercial trade with England was one of the most important factors which brought Smith to the New World (Frost, 1982). Among the first of these endeavors were the processing and export of tar and pitch, made from the burning of dead longleaf pine "lightwoods" collected from the woodlands south of the James. In pre-Revolutionary times, the production of turpentine, distilled from the resin of live "boxed" longleaf pines, was also important. Export of these naval stores continued until the mid-nineteenth century, by which time stands of longleaf pine had been largely depleted (Frost, 1982).

The first Europeans to settle in the county were led by Captain Christopher Lawne, who landed on the south side of the James at the mouth of the creek that now bears his name. The county, first called Worrosquoyacke, was one of the original eight shires of colonial Virginia. After 1620, the shire was known as "Isle of Wight Plantation", being renamed after the coastal English island, home to many of its earliest immigrants. Other settlements along the James and Pagan rivers followed until

the great Indian uprising in the spring of 1622. In response to this uprising, the settlers "vanquished" the Indians the following year, destroying their villages and crops, driving them from their lands, and forcing them to "take refuge in the woods or marshes." Upon resumption of settlements, the early economy, based on tobacco farming and shipbuilding, saw some measure of prosperity. When tobacco from the area proved to be of an inferior grade, farmers turned to the cultivation of corn and wheat, and the curing of bacon and ham. With the invention of the cotton gin, cotton became important for the area, and remained so until the Civil War. It was only after this time that peanuts became a major crop in Isle of Wight (Morrison, 1907).

Isle of Wight's largest city, Smithfield, was settled in the 1650's and incorporated as a town by 1752. The County Court was originally established several miles west of the town and moved to Smithfield in 1750. It remained there until 1800, when it was moved to the village of Isle of Wight Court House. (Morrison, 1907.)

Botanical History and Rationale for the Study

The history of botanical exploration in southside Virginia is somewhat obscure. While it is possible that such botanists as John Clayton, John Bartram, Mark Catesby, and others may have done some work in the area, there is little evidence to support that they did so. In 1806, Frederick Pursh of Gloucester spent

time in Southampton County, just across the Blackwater from Isle of Wight, and it is not unlikely that he crossed the river to explore parts of that area (Frost, 1982). More extensive floristic study of the entire southside did not occur until the late 1930's, when Merritt Lyndon Fernald, in the midst of his monumental revision the seventh edition of Gray's Manual of Botany, came to explore the southernmost extreme of the manual's range (Fernald, 1937). Among Fernald's trips were ones to a "dammed-up brook in the woods ... on the road south from Zuni" (Antioch Swamp), "rich loamy wooded slope north of Walters" (possibly Carrowaugh Swamp), "dry, sandy pine woods east of Zuni", "the bottomland of the Blackwater ... at Zuni", and the Zuni Pine Barrens (Fernald, 1937). Fernald lamented the lack of interest in the flora of southeastern Virginia, quoting the comments made by southern botanist R.M. Harper as he travelled by train through these very areas: "Of the country between Norfolk and Emporia, [i.e., almost all of southside Virginia], there is little to be said...," and, "For some reason not altogether obvious, the flora of those parts of the eastern United States where either Pinus taeda or Pinus echinata is the most abundant tree is rather uninteresting" (Harper, 1907, in Fernald, 1937). After having discovered countless state and regional records there and describing a wealth of new varieties and even species, Fernald characterized Harper's train-window botanizing as quite inadequate. Fernald's discoveries helped fill in noticeable gaps in our knowledge of species and habitat

types found in the pinelands of southern New Jersey and in the Carolinas, but until then, unknown in between (Fernald, 1937).

More recently, Frost (1982) and Frost and Musselman (1987) have examined the Zuni Pine Barrens in greater detail. Their study has been used to help establish the Blackwater Ecological Preserve for management of the last remnant longleaf pine barrens left in Virginia. The only other recent examination of the Isle of Wight flora has been Whitmarsh's (1980) study of the areas adjacent to the James River. Although Fernald's trips to southeastern Virginia were certainly ground-breaking, they were too few and spread over too great an area to sufficiently cover the flora of each county he visited. Thus, apart from the intensive study in the Zuni Pine Barrens, western Isle of Wight has remained in need of a detailed floristic examination. Other goals of this investigation include the description of characteristic habitats, and the discovery of other areas or plants of special interest within the county, with a view toward their preservation.

General Ecological Interest

In southeastern Virginia, there is a transition from the deciduous forests of central eastern North America to the evergreen forests of the Southeast (Braun, 1950). Braun divided the coastal plain of Virginia into the Oak-Pine Forest region which extends up the coastal plain into Maryland, Delaware, New

Jersey and Long Island, and the Southeastern Evergreen Forest region, which continues down the Atlantic and Gulf coastal plains. She chose the James River as the boundary between these two regions. While southside Virginia is, obviously, rather similar to those areas immediately north of the James, Braun distinguished the two areas by the presence of certain key species, including Pinus palustris (longleaf pine). In addition, there is a major soil change at the James, from the gray-brown soils of the Sassafras series on the Peninsula of Virginia, to the yellow and red soils of the Norfolk series. Quarterman & Keever's (1962) work described the Southeastern United States as Southern Mixed Hardwood Forest, but they considered areas only as far north as South Carolina. Ware et al. (in press) extended this region into North Carolina and Southeastern Virginia, at least as far north as the James. Their justification is based in part on the presence in the area of both the lowland and upland forms/species of laurel oak (Quercus laurifolia Michaux and Q. hemisphaerica Bartram, respectively).

The Zuni Pine Barrens represents the last remnant of what was once a prevalent vegetation type in southeastern Virginia: the fire-maintained Pinus palustris-Quercus laevis (longleaf-turkey oak) savannah. Frost (1982) detailed the most likely set of factors which led to the virtual disappearance of the longleaf pine communities in Virginia, including the introduction of feral hogs as early as Smith's original landing in 1608 (hogs eat the grass stage seedlings, which eliminates reproduction),

timbering in both the colonial and nineteenth century periods, boxing for turpentine, and fire suppression. The study area, therefore, represents the northern-most remnant of what is a distinctively southern vegetation.

PHYSICAL DESCRIPTION

Climate

Isle of Wight County has a mild coastal climate, due largely to the moderating effects of the nearby Atlantic Ocean and Chesapeake Bay (cf. Ware et al., in press). Details can be extrapolated from Weather Bureau data from Sussex County (Waverly and Wakefield Stations[1]) to the west, and the City of Suffolk (Holland Station) to the southeast, all of which are located within fifteen miles of the study area. The mean annual temperature from 1974 through 1988 from the Holland station was 58.4^0 F, ranging from 57.4^0 to 59.7^0, and that of the Sussex County stations was 58.6^0 F, ranging from 57.4^0 to 59.5^0. For this same period, the mean of the high temperatures from the Holland station was 98^0 F, ranging from 95^0 to 104^0, and that of the Sussex stations was 99^0 F, ranging from 94^0 to 105^0. The mean for the low temperatures from the Holland station was 7^0 F, ranging from (-5^0) to 18^0, and that of the Sussex stations was 6^0, ranging from (-8^0) to 18^0. The average frost-free period at the Holland station was 192 days, while that of the Sussex stations was 193 days.

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[1]The Weather Bureau station in Sussex County was moved from Wakefield to Waverly, and then back to Wakefield.

Precipitation was fairly evenly distributed throughout the seasons. The average of mean annual precipitation from the Holland Station in the years from 1974 to 1988, was 48.18 inches, with a range from 33.40" to 62.69". That of the Sussex stations was 44.89 inches, with a range from 36.71" to 63.35". This includes data from several drought years. Summaries of these data can be found in Tables 1 and 2.

TABLE 1: CLIMATOLOGICAL DATA from the Holland Station in the City of Suffolk, Virginia, from 1974-1988. [Adapted from the U.S. Dept. of Commerce, Weather Bureau, Climatological Data, Annual Summaries, vols. 79-93.]

YEAR	TEMPERATURE (^{0}F) MEAN	HIGH	LOW	ANNUAL PRECIP. (in.)	LAST SPRING MIN. 32^0	FIRST FALL MIN. 32^0	FROST FREE DAYS
1974	59.3	95	18	49.50	4/4	10/4	180
1975	59.7	97	16	51.10	4/13	10/31	201
1976	57.9	97	11	44.64	4/13	10/19	189
1977	59.1	99	3	47.09	4/10	10/18	191
1978	57.4	95	5	53.10	4/23	10/9	169
1979	57.9	97	6	62.69	4/8	10/16	191
1980	58.2	104	6	33.40	5/10	10/26	169
1981	57.6	99	1	40.17	4/22	10/20	181
1982	58.6	95	5	54.13	4/10	10/18	191
1983	58.4	101	5	54.62	4/21	10/28	190
1984	58.6	95	9	48.28	4/11	11/7	210
1985	58.8	95	-5	52.43	4/11	12/3	236
1986	59.4	99	12	37.96	3/25	10/22	209
1987	58.0	100	6	46.06	4/6	10/22	199
1988	57.6	98	11	47.57	4/17	10/9	175
AVG.:	58.4	98	7	48.18			192

TABLE 2: CLIMATOLOGICAL DATA from the Waverly & Wakefield Stations[2] in Sussex County, Virginia, from 1974-1988. [Adapted from the U.S. Dept. of Commerce, Weather Bureau, Climatological Data, Annual Summaries, vols. 79-93.]

YEAR	TEMPERATURE (^{0}F) MEAN	HIGH	LOW	ANNUAL PRECIP. (in.)	LAST SPRING MIN. 32^0	FIRST FALL MIN. 32^0	FROST FREE DAYS
1974	----	97	18	37.22	4/11	10/3	175
1975	59.5	98	14	57.75	4/14	10/31	200
1976	57.9	101	6	43.63	4/28	10/19	174
1977	----	101	4	-----	5/10	10/18	161
1978	----	---	-	-----	---	---	---
1979	57.4	---	2	63.35	4/8	10/15	188
1980	----	101	4	36.71	4/17	-----	---
1981	----	101	0	40.27	4/26	10/20	177
1982	----	---	-	-----	3/30	12/8	---
1983	58.5	105	2	41.96	4/21	10/28	190
1984	58.9	96	7	43.11	4/11	11/7	210
1985	59.1	94	-8	45.22	4/11	11/24	227
1986	59.0	99	10	37.00	3/25	10/21	210
1987	----	100	11	47.61	4/1	10/25	207
1988	----	---	7	-----	3/28	10/9	195
AVG:	58.6	99	6	44.89			193

[2]Data from 1974-1977, and after Dec., 1982: Wakefield; data between 1978 and Dec., 1982: Waverly.

Physiography and Geology

The study area is located on the Isle of Wight Plain of the outer Coastal Plain, a section of the Atlantic Plain of eastern North America (Frost, 1982). The area exhibits three general relief patterns: (1.) The terraces and flood plains of the Blackwater River, dominated by the Chipley and Alaga series of soils, which are characterized by moderately to somewhat excessively drained, nearly level to gently sloping, sandy soils; (2.) Dissected uplands, dominated by the Sagle, Uchee, and Yemassee series of soils, which are characterized by well to somewhat poorly drained, nearly level to gently sloping loamy soils; and (3.) the broad loamy upland flats, locally called "pocosins", which are found only at the eastern extremes of the study area. These areas are dominated by the Mayette and Yemasse series of loamy soils, characterized by their poor drainage due to a lack of relief (Kitchel et al., 1986). Highest and lowest elevations within the study area are 90 and 20 feet, for a total relief of only 70 feet.

The Isle of Wight Plain lies between the Surry and Suffolk scarps (Fig. 4). Deep below lies the Pliocene Yorktown Formation of stiff clay, silt, and coquinite. Above this, lies the Sedley Formation (Pliocene or early Pleistocene), made of marine or estuarine clay, silt, and fine sand (Fig. 5). Above the Sedley lies the Bacon's Castle Formation of roughly the same time period, made of fluvial-channel silt, fine sand, gravel and

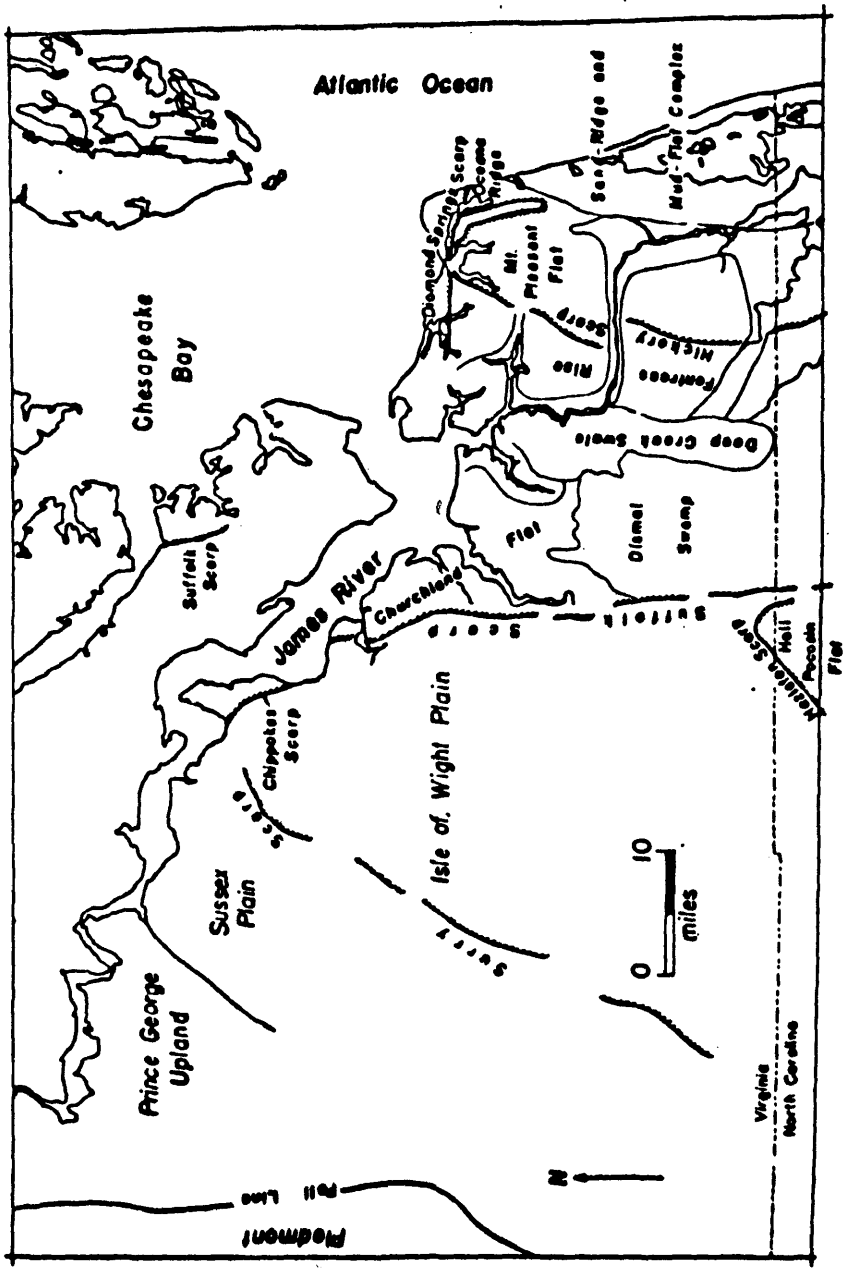

FIG. 4: Major morphologic subdivisions of southeastern Virginia (Oaks et al., 1974, p. 62).

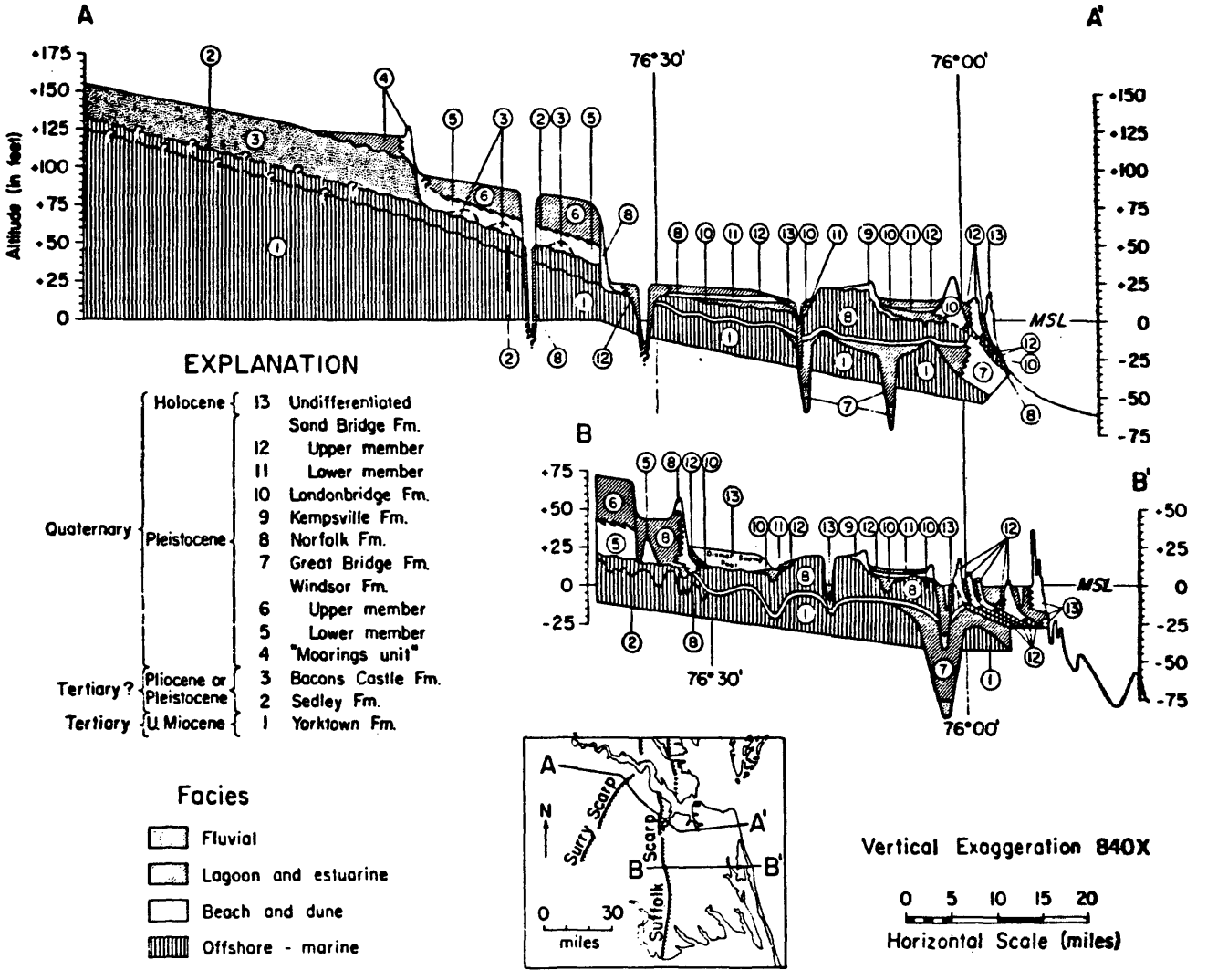

FIG 5: Diagramatic geologic sections showing relations and facies of post-Yorktown stratigraphic units (Oaks et al., 1974, p. 70).

cobbles. The Bacon's Castle Formation is of quite variable depth below the Isle of Wight Plain. The plain's surface, the Windsor Formation, was formed in mid-Pleistocene time. Its lower member is made of beach and near-shore sand and fine gravel; its upper of lagoon silty sand. Because of the variation in the depth of the Bacon's Castle Formation, the Windsor lays directly on top of the Sedley in some locations (Oaks et al., 1974).

A series of sea level changes seems to explain the formation of the Coastal Plain features in southeastern Virginia. The Yorktown was deposited while the shoreline was positioned at the Fall Line near present-day Petersburg. When the sea level dropped, the shoreline migrated to a point east of the present Suffolk Scarp, at which time the Yorktown was dissected by erosion. As the shoreline migrated back toward the Fall Line, estuarine sediments filled the dissections and then covered the entire Yorktown formation, forming the Sedley. The sea levels dropped again and the shoreline migrated back to a point east of the Suffolk Scarp, during which time channels were cut and then filled with the Bacon's Castle Formation (Oaks et al., 1974).

With another rise in sea level, the shoreline fell at the Surry Scarp (which enclosed a lagoon over the Sussex Plain just west). The shoreline migrated back past the Suffolk Scarp, and the Bacon's Castle was heavily eroded at this time. With the movement of the shoreline back to the Surry Scarp, the lower member of the Windsor was deposited. The fine grain size, unoxidized color, and broad flat deposition of the upper member

of the Windsor suggests that the area was later enclosed as a lagoon by a barrier somewhere east of the Suffolk Scarp. With the following drop in sea level, the Isle of Wight Plain has never since been submerged (Oaks et al., 1974).

The surface formation of the study area, therefore, represents a lagoonal deposit [probably of Sangamon time (Oaks & Coch, 1963; Frost, 1982), though perhaps of mid-Pleistocene time (Oaks et al., 1974)], which was subsequently dissected by the erosion of the Blackwater and its tributaries. Evaluation of the upper layer of soil from representative areas reveals the acidic nature of the substrate, though silty deposits in bottomlands tend to moderate pH and, in some areas, increase the mineral content. Table 3 summarizes soil sampling data.

TABLE 3: SOIL DATA from sample of representative bottomland and upland habitats. Testing performed by the Agricultural Extension Service, Virginia Polytechnic Institute and State University, Blacksburg. Area labels correspond to those used in the chapter on "Habitat & Vegetation Analysis". pH reported in standard units. Mineral data reported in lbs/acre.

AREA	pH	P	K	Ca	Mg
BOTTOMLANDS					
LS	5.1	10	66	312	62
PS	5.2	14	69	720	113
XP	4.8	8	37	456	53
BB	4.9	6	34	456	58
UPLANDS					
SS	4.6	10	59	384	67
GH	4.2	8	59	288	58
MS	4.7	5	50	552	74
AS	4.0	6	62	264	67

METHODS

Floristic Methods

Forty-two collecting trips were made to the study area at the frequency of roughly once per week during the growing seasons of March, 1989, through June, 1990. Specimens were collected, in triplicate when possible, and notes regarding location, habitat, and relative abundance were recorded. Plants were numbered with the author's collection number, pressed, dried, and identified. A voucher set of specimens has been deposited with the Herbarium of the College of William & Mary (WILLI), and partial duplicate sets will be deposited at the herbaria of the University of North Carolina at Chapel Hill (NCU) and Old Dominion University (ODU).

Specimens were identified using the following manuals: Radford, Ahles, & Bell (1968), Fernald (1950), Gleason (1952), Gleason & Cronquist (1963), Godfrey & Wooten (1979 & 1981), Steyermark (1963), Strausbaugh & Core (1978), Cronquist (1980), Duncan (1975), Hitchcock & Chase (1950), Rehder (1940), Kral (1966), Russell (1965), Gould (1975), and Bailey (1949). Nomenclature follows that of the Atlas of the Virginia Flora (Harvill et al., 1986), with the following exceptions. Whereas Harvill has treated the upland and lowland forms of laurel oak as one species (Quercus laurifolia), they are here treated as two (the lowland Q. laurifolia Michaux and the upland Q.

hemisphaerica Bartram). Harvill has grouped several closely related species of Viola as V. palmata. Here they are treated as distinct species or varieties, following Russell (1965). Lastly, while Harvill considers Carex lupuliformis a synonym for C. lupulina, they are here considered distinct species. Geographical data were also taken from the Atlas.

Ecological Methods

Vegetational sampling of wooded areas was performed to determine vegetational trends within the study area. An attempt was made to choose representative habitats of reasonable maturity in both swamp bottoms and uplands. Eight stands were measured in the autumn of 1989 and three in the spring of 1990. These were distributed roughly throughout the study area. Dominance was determined by measuring basal area (m^2/ha) according to the Bitterlich method (Beers and Miller, 1964, in Diggs & Hall, 1981). Relative dominance for each species is expressed in terms of the percentage of all species present. Density (trees/ha) was determined for large (> 4" dbh) and small (between 1 & 4" dbh) trees based on counts of stems within circular plots with radii of 10 m (4 plots/stand where possible, 2-3 plots/stand elsewhere). Relative density for each species is expressed as the percentage of all species present. For large trees, relative dominance and relative density values were averaged to yield the relative importance value (I.V.) for each species.

HABITAT ANALYSIS AND VEGETATIONAL STUDIES

The southern flavor of the study area is readily identifiable in both the flora and the vegetation. Many species, like Asimina parviflora and Cnidoscolus stimulosus, are found at the northern extreme of their ranges in Isle of Wight. Other species which are found sparingly north of the James River become major components of the vegetation only south of the river. Although Nyssa aquatica, for example, is found in swamps on the Virginia Peninsula, it was never important in the canopy of stands studied by Glascock and Ware (1979). In the study area, however, this species becomes an important constituent of the swamp forest vegetation. Also, while many of the species found on the sand hills of the southside are present on the Peninsula, they do not occur in the same characteristic open pine woodland communities. A brief description of the habitats and arborescent vegetation of the study area follows.

BOTTOMLANDS

Flooded Open Swamps

Swamps which remain deeply flooded throughout the year, and with a thin canopy, are characterized by the flood tolerant Taxodium distichum (eastern bald cypress), sometimes in association with Nyssa aquatica (water tupelo). Nyssa sylvatica

(black gum) and Acer rubrum (red maple) are often present in or at the edge of the flooded areas. Flooding is typically due to beaver dams, abandoned mills, or small bridges. Floating aquatics, such as Spirodela spp., and Lemna valdiviana (duckweeds), are occasionally present. Submergents and emergents such as Hydrocotyle (pennywort), Proserpinaca (mermaid weed), Myriophyllum (milfoil), Callitriche (water starwort), and Sparganium americanum (bur reed) are also frequently represented. At the edges of the flooded swamps, Justicia 2lanceolata (water-willow) commonly forms a dense cover. Iris virginica (blue flag) is often found blooming in the spring and Rosa palustris, the swamp rose, is prominent in mid-summer on cypress stumps and at flooded swamp edges.

Partially Flooded Swamps and Stream Bottoms

Vegetational analysis of bottomlands tributary to the Blackwater showed several ecological trends. In areas of prolonged flooding, Nyssa aquatica and Taxodium distichum were usually the important dominants. Stand "PI" (Table 4), a flooded swamp, expresses the former trend. Nyssa aquatica was the most important tree (I.V. of 26.0%), in association with Taxodium distichum (16.8%), and Fraxinus pennsylvanica, (green ash [15.1%]). Of these three species, only Fraxinus seems to be reproducing well, as evidenced by its abundance in the understory (small tree density of 27.7%). It is known, however, that Taxodium seeds germinate only in years of sufficient drought

TABLE 4: Vegetational data from Stand PI, a water tupelo swamp.

Species	% Dominance	% Density		I.V.
		Large	Small	
Nyssa aquatica	27.9	24.1	0	26.0
Betula nigra	16.3	24.1	23.4	20.2
Fraxinus pennsylvanica[3]	16.3	17.2	27.7	16.8
Taxodium distichum	16.3	13.8	2.1	15.1
Acer rubrum	9.3	3.4	27.7	6.4
Liquidambar styraciflua	2.3	10.3	2.1	6.3
Quercus lyrata	7.0	0	0	3.5
Platanus occidentalis	2.3	3.4	6.4	2.9
Quercus laurifolia	0	3.4	0	1.7
Populus heterophylla	2.3	0	0	1.2
Carpinus caroliniana	0	0	10.6	0

TOTAL DENSITY:
Large trees: 462 trees/ha
Small trees: 748 trees/ha

TOTAL BASAL AREA:
49.4 m^2/ha

[3]May include other Fraxinus spp.

(Fowells, 1965), which allow for the exposure of the mineral soil surface, and may occur several decades apart. The seeds of Nyssa aquatica require full sunlight in addition to a drying of the swamp floor for successful germination (Fowells, 1965). Betula nigra (river birch) was also found to be important (I.V. of 20.2%), but only on the berm built through the middle of the swamp, where flooding is less deep. Acer rubrum is present in the canopy (I.V. of 6.4%), but seems to function more as an understory tree in this area (small tree density of 27.7%).

Other swamp trees, such as Populus heterophylla (swamp cottonwood), Carya aquatica (water hickory), Quercus lyrata (overcup oak), and Q. laurifolia (lowland laurel oak) may be present in such areas. Betula nigra, Platanus occidentalis (eastern sycamore), and Liquidambar styraciflua (sweet gum) are frequently found at the somewhat drier edges.

Bottomland areas of less frequent flooding tend to be dominated by Nyssa sylvatica. In stand "LS" (Table 5), Nyssa sylvatica is overwhelmingly dominant (I.V. of 53.0%), associated with Liquidambar styraciflua (13.3%), and, in the wetter spots, Taxodium distichum (12.0%). None of the dominants seem to be reproducing particularly well under the canopy. Nyssa sylvatica requires full sun for successful seed germination (Fowells, 1965), a condition not met under the rather thick canopy of this stand. Low levels of sun account for the failure of Liquidambar reproduction. Ilex opaca (American holly), Acer rubrum and Carpinus caroliniana (ironwood) are the major understory trees

TABLE 5: Vegetational data from Stand LS, a black gum swamp.

Species	% Dominance	% Density		I.V.
		Large	Small	
Nyssa sylvatica	54.0	52.0	0	53.0
Liquidambar styraciflua	11.8	14.7	5.2	13.3
Taxodium distichum	14.5	9.3	0	12.0
Acer rubrum	6.6	5.3	27.6	6.0
Carpinus caroliniana	2.6	9.3	20.7	6.0
Liriodendron tulipifera	4.0	2.7	1.7	3.4
Fraxinus sp.	4.0	2.7	0	3.4
Fagus grandifolia	2.6	1.3	0	2.0
Ilex opaca	0	1.3	36.2	0.7
Quercus laurifolia	0	1.3	0	0.7
Ostrya virginiana	0	0	8.6	0

TOTAL DENSITY:
Large trees: 796 trees/ha
Small trees: 615 trees/ha

TOTAL BASAL AREA:
58.2 m^2/ha

(small tree densities of 36.2%, 27.6%, and 20.7%, respectively),but are not important canopy species. With an increase in elevation of only a few inches, there is a major vegetational change to upland species [e.g., Quercus alba (white oak), Q. velutina (black oak), and Liriodendron tulipifera (tuliptree)]. Here, Cornus florida (flowering dogwood) seems to become the prevalent understory tree, replacing Ilex opaca. Carpinus also drops out of the understory just upland, but Acer rubrum continues to be important on these gentle swamp slopes.

The vegetation of certain areas seems to be intermediate between those of the flooded Nyssa aquatica swamps and the slightly drier N. sylvatica swamps. In the small stream bottom stand "PS" (Table 6), N. sylvatica is the most important species (I.V. of 40.1%). Nyssa aquatica is, however, also important in the canopy (I.V. of 14.0%), and, in addition, it is reproducing reasonably well underneath (small tree density of 6.9%, compared to no small N. sylvatica trees recorded). Here, as above, Acer rubrum, Carpinus caroliniana, and Ilex opaca are important understory trees. Fraxinus spp. (probably mostly F. pennsylvanica, but field identification is difficult in vegetative condition) are also important in the understory, but are not major canopy trees at this time (I.V. of only 4.1%).

Disturbed Stream Bottoms

Many stream bottoms have been selectively cut for lumber. Stands "XP" and "BB" exhibit such a trend. Stand "XP" (Table 7)

TABLE 6: Vegetational Data from Stand PS, a black gum-water tupelo swamp.

Species	% Dominance	% Density		I.V.
		Large	Small	
Nyssa sylvatica	47.8	32.4	0	40.1
Nyssa aquatica	13.0	14.9	6.9	14.0
Liquidambar styraciflua	10.1	10.8	1.7	10.5
Acer rubrum	8.7	8.1	29.3	8.4
Ulmus americana	4.3	9.5	10.3	6.9
Carpinus caroliniana	4.3	5.4	13.8	4.9
Fraxinus pennsylvanica[4]	1.4	6.8	12.1	4.1
Taxodium distichum	4.3	2.7	0	3.5
Fagus grandifolia	1.4	4.1	8.6	2.8
Quercus alba	1.4	1.4	0	1.4
Quercus michauxii	0	2.7	0	1.4
Ilex opaca	0	1.4	15.5	0.7
Magnolia virginiana	0	0	1.7	0

TOTAL DENSITY:
Large trees: 589 trees/ha
Small trees: 462 trees/ha

TOTAL BASAL AREA:
39.6 m^2/ha

[4]May include other Fraxinus spp.

was the less disturbed of the two. Nyssa sylvatica was the most important species (I.V. of 32.3%). Carpinus, which usually functions only as an understory tree, has become an important component of the canopy as well (I.V. of 21.3%). Liriodendron tulipifera, largely successional in the coastal plain, and the frequent stream bottom species, Liquidambar styraciflua, are also associated with this area. The disturbance is more severe at stand "BB" (Table 8), where the rotting stumps of selective cuttings are still extant. There, Carpinus is overwhelmingly dominant (I.V. of 44.0%), while Nyssa sylvatica was not represented in any of the sampling points. Liquidambar and Quercus phellos (willow oak) are also important (I.V. of 13.4%, and 12.3%, respectively). These stands show a marked increase in the size of individual Betula nigra and Platanus occidentalis trees as well. This situation is similar to ones examined by Glascock & Ware (1979) on the Virginia Peninsula. They postulated that selective cutting of desirable hardwoods in small stream bottoms opens the canopy and thereby "releases" the inhibition of Carpinus, which is usually kept small by shade.

Other Swamp Species

Though not usually significant vegetationally, several tree species were frequently encountered in the canopy of most swamps, including Quercus michauxii (swamp chestnut oak), Q. laurifolia, and Ulmus americana (American elm). Shrubs and woody vines of swamp habitats include Bignonia capreolata (cross vine),

TABLE 7: Vegetational Data from Stand XP, a disturbed stream bottom.

Species	% Dominance	% Density		I.V.
		Large	Small	
Nyssa sylvatica	36.8	27.7	3.3	32.3
Carpinus caroliniana	17.1	25.5	47.8	21.3
Liriodendron tulipifera	10.5	9.6	0	10.1
Liquidambar styraciflua	14.5	5.3	4.3	9.9
Ilex opaca	1.3	13.8	29.3	7.6
Acer rubrum	3.9	7.4	3.3	5.7
Fraxinus pennsylvanica[5]	2.6	3.2	2.2	2.9
Quercus phellos	3.9	1.1	1.1	2.5
Pinus taeda	2.6	1.1	0	1.9
Ostrya virginiana	2.6	1.1	0	1.9
Ulmus americana	2.6	0	0	1.3
Fagus grandifolia	1.3	1.1	0	1.2
Carya tomentosa	0	1.1	1.1	0.6
Quercus alba	0	1.1	0	0.6

[5]May include other Fraxinus spp.

TABLE 7 (continued)

Quercus velutina	0	1.1	0	0.6
Vaccinium sp.	0	0	3.3	0
Magnolia virginiana	0	0	2.2	0
Cornus florida	0	0	1.1	0
Symplocus tinctoria	0	0	1.1	0

TOTAL DENSITY:
Large trees: 748 trees/ha
Small trees: 732 trees/ha

TOTAL BASAL AREA:
43.6 m^2/ha

TABLE 8: Vegetational Data from Stand BB, a disturbed stream bottom.

Species	% Dominance	% Density		I.V.
		Large	Small	
Carpinus caroliniana	25.0	62.9	70.8	44.0
Liquidambar styraciflua	16.7	10.0	0	13.4
Quercus phellos	18.8	5.7	0	12.3
Platanus occidentalis	16.7	5.7	0	11.2
Betula nigra	12.5	5.7	0	9.1
Ilex opaca	2.1	1.4	0	1.8
Quercus laevis	2.1	1.4	0	1.8
Quercus michauxii	2.1	1.4	0	1.8
Taxodium distichum	2.1	1.4	0	1.8
Ulmus americana	0	2.9	0	1.5
Quercus alba	2.1	0	0	1.1
Ostrya virginiana	0	1.4	4.2	0.7
Ilex decidua	0	0	20.8	0
Acer rubrum	0	0	4.2	0

TOTAL DENSITY:
Large trees: 557 trees/ha
Small trees: 191 trees/ha

TOTAL BASAL AREA:
27.5 m^2/ha

flowering in the spring, as well as Cephalanthus occidentalis (button bush) and Decumaria barbara (climbing hydrangea) blooming in the summer. Viola spp. (violets), Ranunculus spp. (buttercups), including R. recurvatus, and Galium spp. (bedstraws) were frequent spring-flowering herbs. In the early summer, Arisaema triphyllum (jack-in-the-pulpit), Circaea lutetiana (enchanter's nightshade), and Lysimachia spp. (loosestrifes) were conspicuous in swamp bottoms. Summer swamp herbs included Impatiens capensis (jewel-weed), Glyceria striata (manna grass), and many Carex spp. along the swamp margins, and Saururus cernuus (lizard tails), Hypoxis hirsuta (yellow star-grass), and Bidens spp. (beggar's ticks) in the wetter swamp bottoms. Lobelia cardinalis (cardinal flower) and Ludwigia spp. were found in more open areas. Autumn-flowering herbs include Pilea pumila (clear-weed), and Chelone glabra (turtlehead).

UPLANDS

Sand Hill Communities

Once common throughout the southside counties of Virginia, sand hill communities, thought to be the vegetated remnants of ancient dunes, are quickly disappearing. Only the Blackwater Preserve contains Pinus palustris woods, while other sand hill communities are now dominated by Pinus taeda. Braun (1950) had observed this when describing the northern extreme of her Southeastern Evergreen Forest Region: "In [southside] Virginia,

'pine barrens' in which loblolly pine is the dominant species are comparable to the longleaf pine barrens farther south" (Braun, 1950). It seems likely that these P. taeda communities are second-growth woods which develop after the clearing of longleaf pine from the area. Stand "SH" (Table 9) represents one such area. Dominated by Pinus taeda (I.V. of 40.3%), both Quercus velutina [black oak (21.6%)] and P. echinata [short-leaf pine (14.9%)] are also important. As pines do not generally reproduce under a closed canopy, and as neither of the pine species present is especially fire tolerant, it is not expected that this community will be able to maintain itself, whether fire is suppressed or permitted as an environmental factor. This expectation is supported by the composition of the understory, where Quercus falcata (Spanish oak), barely present in the canopy, has a small tree density of 22.9%. To a lesser degree, Quercus velutina, Liquidambar styraciflua and P. taeda are also present. Thus, it seems reasonable to expect that these woods, if left undisturbed, will eventually become a mixed hardwood climax community as predicted by Quarterman & Keever (1962), and Ware et al. (in press). Small trees associated with the understory include Oxydendron arboreum [sourwood (small tree density of 13.3%)], and Sassafras albidum (8.3%).

Perhaps as interesting as the canopy and understory dominants are other "indicator" species associated with these sand hill communities. Additional arborescent species include Carya pallida (sand hickory), Quercus hemisphaerica, Q.

TABLE 9: Vegetational Data from Stand SH, a sand hill community.

Species	% Dominance	% Density		I.V.
		Large	Small	
Pinus taeda	46.0	34.5	9.6	40.3
Quercus velutina	26.0	17.2	10.8	21.6
Pinus echinata	16.0	13.8	2.4	14.9
Oxydendron arboreum	6.0	10.3	13.3	8.2
Quercus falcata	4.0	5.2	22.9	4.6
Liquidambar styraciflua	0	6.9	9.6	3.5
Nyssa sylvatica	2.0	3.4	3.6	2.7
Sassafras albidum	0	3.4	8.3	1.7
Diospyros virginiana	0	1.7	4.8	0.9
Quercus margaretta	0	1.7	3.6	0.9
Quercus nigra	0	1.7	0	0.9
Acer rubrum	0	0	2.4	0
Carya pallida	0	0	1.2	0
Cornus florida	0	0	1.2	0
Fagus grandifolia	0	0	1.2	0
Ilex opaca	0	0	1.2	0
Juniperus virginiana	0	0	1.2	0
Quercus hemisphaerica	0	0	1.2	0
Viburnum prunifolium	0	0	1.2	0

TOTAL DENSITY:
Large trees: 462 trees/ha
Small trees: 661 trees/ha

TOTAL BASAL AREA:
28.7 m^2/ha

margaretta (scrubby post oak), and Diospyros virginiana (persimmon). Vaccinium spp. (blueberries), including V. elliottii, V. stamineum, V. pallidum, and V. crassifolium (the latter not found in the study area, but present in the Blackwater Preserve), Gaylusaccia spp. (huckleberries), Myrica cerifera (wax myrtle), Rhus toxicodendron (poison oak), and the southern Asimina parviflora (dwarf pawpaw) are among the shrubby species. Important herbaceous indicators of sand hill communities include Opuntia humifusa (prickly pear), Euphorbia ipecacuanhae (Carolina ipecac), Helianthemum canadense (rockrose), and Cnidoscolus stimulosus (tread-softly), (Ludwig, 1990). Cypripedium acaule (pink lady's slipper), Sisyrichium spp. (blue-eyed grass) and Lupinus perennis (lupine) are also locally abundant, as are fruticose lichens such as reindeer moss, which forms large clumps in open pine litter.

Early Successional Pine Woods

A large portion of the study area is covered by pine woods in various stages of succession. Regrowth of such woods is typical after the clear-cut logging of more mature stands. After dicot invaders and grasses give way to woody species (Monette & Ware, 1983), these areas form dense, almost impenetrable thickets of small trees, shrubs, and woody vines. Pines (usually Pinus taeda), and then sweetgum and oaks, eventually form a distinct canopy above the thick underbrush. Other hardwoods then grow up under the canopy as the stand matures.

Stand "SS" (Table 10) represents a wooded plot still dominated by Pinus taeda (I.V. of 37.5%) and Liquidambar styraciflua (23.9%), but in which other hardwoods are beginning to take hold. Unlike P. taeda, with a small tree density of only 1.3%, L. styraciflua is reproducing well under the canopy (small tree density of 36.5%). Monette and Ware (1983), however, found that a high density of small sweetgums does not necessarily translate into future canopy importance, an observation consistent with all but the most disturbed beech-rich stands discussed below. Oaks are just beginning to enter the understory and canopy at this time, with Quercus alba being the most important (I.V. of 8.8%). The understory is largely dominated by Acer rubrum (small tree density of 21.4%).

Species composition of these successional stands is somewhat like that of the sand hill communities. In addition to canopy dominants, Pinus echinata, Diospyros virginiana, and Quercus falcata are all present, as are many of the shrubs and herbs associated with the sand hills. The largest difference between the two types of communities is, perhaps, the great density of trees and shrubs which characterizes early successional plots. The projected density of small and large trees per hectare in stand "SS" (796 large trees/ha, and 1265 small trees/ha; Table 10) is nearly twice that of sand hill stand "SH" (461.6 large trees/ha, and 660.5 small trees/ha; Table 9). The density of the trees is compounded by the abundance of woody vines, such as Smilax spp. (greenbrier), including the southern

TABLE 10: Vegetational Data from Stand SS, a successional pine woodland.

Species	% Dominance	% Density		I.V.
		Large	Small	
Pinus taeda	42.9	32.0	1.3	37.5
Liquidambar styraciflua	24.7	23.0	36.5	23.9
Acer rubrum	6.5	14.0	21.4	10.3
Quercus alba	6.5	11.0	2.5	8.8
Platanus occidentalis	6.5	6.0	0.6	6.3
Quercus phellos	3.9	5.0	1.3	4.5
Liriodendron tulipifera	5.2	3.0	1.3	4.1
Quercus falcata	1.3	4.0	3.1	2.7
Quercus nigra	1.3	1.0	3.8	1.2
Ulmus americana	1.3	1.0	0	1.2
Oxydendron arboreum	0	0	8.2	0
Prunus serotina	0	0	6.3	0
Myrica cerifera	0	0	3.8	0
Magnolia virginiana	0	0	2.5	0
Aralia spinosa	0	0	1.3	0
Carya tomentosa	0	0	1.3	0
Diospyros virginiana	0	0	1.3	0
Ilex opaca	0	0	1.3	0

TABLE 10 (continued)

Species	% Dominance	% Density		I.V.
		Large	Small	
Nyssa sylvatica	0	0	1.3	0
Pinus echinata	0	0	1.3	0
Amelanchier sp.	0	0	0.6	0

TOTAL DENSITY:
Large trees: 796 trees/ha
Small trees: 1265 trees/ha

TOTAL BASAL AREA:
44.2 m^2/ha

S. laurifolia, Vitis spp.(grapes), and Gelsemium sempervirens (yellow jessamine). Shrubby species include Vaccinium spp., Aralia spinosa (devil's walking stick), Rhododendron spp., (azalea) and Myrica cerifera (wax myrtle). Frequent herbs include Hypericum spp., such as H. gentianoides (pineweed), and H. hypericoides (St. Andrew's-cross), Elephantopus tomentosus (elephant's foot), Bartonia virginica (yellow bartonia), and in more open spots Polygala lutea (orange milkwort).

Beech-Rich Uplands

While the potential climatic climax community of the American Southeast has long been discussed, it remains somewhat elusive. One reason for this problem is that it never existed historically to any appreciable degree, and may never come to exist (S. Ware, personal communication). Although fire has been largely controlled in the Southeastern States, expected post-pine communities are not always easily located. As Ware et al. (in press) note, the Southern Mixed Hardwood Forest region contributes 20% of the U.S. lumber supply from an area of only 6% of the country. Coupled with pressures from agriculture, livestock farms, and processing plants, undisturbed climax forests are not often found in the Southeast, especially in areas like Isle of Wight, which have been more or less continuously exploited since the early days of European settlement. Braun

(1950) predicted that in the northern part of the Southeastern Evergreen region, oak-hickory communities would replace the fire-maintained pine communities on flat uplands. Farther south, beech-magnolia forests would predominate. Quarterman and Keever (1965) predicted that Fagus grandifolia, Quercus laurifolia, Magnolia grandiflora (southern magnolia), Quercus alba, and Liquidambar styraciflua would be among the most important species in the mature vegetation of their Southern Mixed Hardwood Forest (SMHF), which extended to central North Carolina. Monette and Ware (1983) and DeWitt and Ware (1979) have argued that this general association is also true for both the southeastern and central coastal plains of Virginia as well. Braun distinguished the flat uplands dominated by oaks and hickories from the steeper slopes dominated by beech woods, a concept supported by Nesom and Treiber (1970). DeWitt and Ware (1979), however, found no such distinction on the coastal plain of Virginia, where Fagus grandifolia was dominant in all mature uplands.

In three of the four Isle of Wight stands sampled where pines were not dominant, Fagus grandifolia was the most important canopy tree (Tables 11-14). In the fourth stand, it was second most important. As Magnolia grandiflora is not native in Isle of Wight, it is not surprising that it never reached the canopy in any of the sampled sites. Quercus laurifolia, at its northern extreme, was encountered only occasionally. Ware (1970) has suggested that at the northern limits of the SMHF, Liriodendron

tulipifera (tuliptree) may replace these species, an observation consistent with the Isle of Wight stands described below. It should be noted, however, that the "mature" stands sampled from the study area all show evidence of disturbance. Trunks of the slow growing F. grandifolia in these stands were all considerably larger than those of other canopy dominants, a phenomenon linked with the selective cutting of more valuable hardwoods, such as Quercus alba. As such, these stands should not be considered characteristic of climax SMHF woods per se, but they are quite typical of the upland woods found within the study area.

Two of the stands sampled were found on gently rolling uplands adjacent to swamps. In stand "GH" (Table 11), Fagus grandifolia and Quercus velutina shared importance (I.V.'s of 22.5% and 21.5%, respectively). Quercus alba, an important tree of the SMHF climax communities, had an I.V. of only 8.0%, suggesting that it may have been selectively removed. Carya tomentosa [mockernut hickory (10.6%)], Liriodendron tulipifera (8.8%), and Pinus taeda (8.8%) were all present as well. Fagus grandifolia is reproducing quite well under the canopy (small tree density of 20.7%), as are Liquidambar styraciflua (11.6%) and Oxydendron arboreum (11.1%). The presence of P. taeda in the canopy and L. styraciflua in the understory indicates that parts of the canopy have been opened, and that these trees have grown up in the canopy gaps.

In stand "MS" (Table 12), another gently rolling upland, Liquidambar styraciflua is the most important canopy tree (I.V.

TABLE 11: Vegetational Data from Stand GH, a beech-rich gently rolling upland.

Species	% Dominance	% Density		I.V.
		Large	Small	
Fagus grandifolia	21.9	23.0	20.7	22.5
Quercus velutina	25.0	18.0	2.5	21.5
Carya tomentosa	3.1	18.0	7.1	10.6
Liriodendron tulipifera	12.5	5.0	5.6	8.8
Pinus taeda	12.5	5.0	2.0	8.8
Quercus alba	9.4	6.6	4.5	8.0
Acer rubrum	3.1	8.2	5.6	5.7
Nyssa sylvatica	6.3	5.0	3.5	5.7
Liquidambar styraciflua	3.1	5.0	11.6	4.1
Oxydendron arboreum	0	5.0	11.1	2.5
Prunus serotina	3.1	0	0.5	1.6
Carpinus caroliniana	0	1.6	2.5	0.8
Cornus florida	0	0	12.6	0
Ostrya virginiana	0	0	5.6	0
Sassafras albidum	0	0	2.5	0
Juniperus virginiana	0	0	1.5	0
Populus grandidentata	0	0	0.5	0

TOTAL DENSITY:
Large trees: 485 trees/ha
Small trees: 1576 trees/ha

TOTAL BASAL AREA:
18.4 m^2/ha

TABLE 12: Vegetational Data from Stand MS, a sweet gum-beech woodland on a gently rolling upland.

Species	% Dominance	% Density		I.V.
		Large	Small	
Liquidambar styraciflua	29.2	27.1	1.5	28.2
Fagus grandifolia	12.5	17.0	20.9	14.8
Acer rubrum	8.3	10.2	9.0	9.3
Quercus falcata	8.3	6.8	0	7.6
Liriodendron tulipifera	8.3	5.1	3.0	6.7
Oxydendron arboreum	4.2	8.5	7.5	6.4
Quercus alba	6.3	3.4	3.0	4.9
Pinus taeda	6.3	3.4	0	4.9
Ilex opaca	4.2	1.7	22.4	3.0
Quercus laurifolia	4.2	1.7	0	3.0
Quercus velutina	4.2	1.7	0	3.0
Quercus michauxii	2.1	3.4	0	2.8
Cornus florida	0	5.1	25.4	2.6
Carya tomentosa	2.1	1.7	1.5	1.9
Carpinus caroliniana	0	1.7	4.5	0.9
Platanus occidentalis	0	1.7	0	0.9
Magnolia virginiana	0	0	1.5	0

TOTAL DENSITY:
Large trees: 470 trees/ha
Small trees: 533 trees/ha

TOTAL BASAL AREA:
27.5 m^2/ha

of 28.2%), followed by Fagus grandifolia (14.8%). Several factors indicate heavy selective cutting in this stand. First, the importance of L. styraciflua indicates that the canopy has been opened in the past, and that pines subsequently entered (present only as canopy relicts: I.V. of 4.9%, small tree density of 0). Pines may then have been replaced by sweet gum, which is now the most important tree. The presence of very large beeches indicates that the area was not cleared, but rather selectively cut. It seems likely that most of the trees removed were oaks, explaining their low importance values (Quercus falcata was the most important, with an I.V. of 7.6%). Further, while Acer rubrum is often found in the understory, it rarely becomes important in upland canopies. Its presence in the canopy here (I.V. of 9.3%) may possibly be explained by its release from shade inhibition, somewhat like the Carpinus situation in disturbed swamps.

The flatter upland stand "AS" (Table 13) is dominated by Fagus grandifolia (I.V. of 25.2%), Liriodendron tulipifera (17.4%), and Quercus alba (12.4%). Thus the stand seems to represent a fairly mature area. Pinus taeda, found again in the canopy (10.9%) but not the understory, is likely a canopy relict of earlier, more successional stages. Liquidambar styraciflua (8.7%) and Ilex opaca (8.6%) are also present. Ilex, however, did not actually make it into the canopy, despite its large trunks. Understory trees with potential for reaching the canopy include F. grandifolia (small tree density of 14.3%),

TABLE 13: Vegetational Data from Stand AS, a beech-rich upland flat.

Species	% Dominance	% Density		I.V.
		Large	Small	
Fagus grandifolia	25.3	25.0	14.3	25.2
Liriodendron tulipifera	19.4	15.3	4.1	17.4
Quercus alba	15.0	9.7	8.2	12.4
Pinus taeda	13.4	8.3	0	10.9
Ilex opaca	9.0	8.3	17.3	8.7
Liquidambar styraciflua	6.0	11.1	13.3	8.6
Acer rubrum	1.5	8.3	18.4	4.9
Quercus falcata	3.0	5.6	0	4.3
Quercus velutina	1.5	2.8	0	2.2
Oxydendron arboreum	1.5	1.4	13.3	1.5
Carpinus caroliniana	1.5	1.4	1.0	1.5
Ostrya virginiana	1.5	1.4	0	1.5
Quercus nigra	1.5	0	2.0	0.8
Quercus shumardii	0	1.4	0	0.7
Magnolia virginiana	0	0	6.1	0
Cornus florida	0	0	1.0	0
Quercus michauxii	0	0	1.0	0

TOTAL DENSITY:
Large trees: 573 trees/ha
Small trees: 780 trees/ha

TOTAL BASAL AREA:
38.5 m^2/ha

Liquidambar styraciflua (13.3%), Quercus alba (8.2%), and Acer rubrum (18.4%). Other understory trees include Ilex opaca (17.3%) and Oxydendron arboreum (13.3%). It seems that this stand closely approximates the beech- and white oak-rich woods of the SMHF, with only slight disturbance.

Stand "CS" (Table 14) was found on a steep north-facing slope above a swamp. Here, Fagus grandifolia (I.V. of 21.6%) and Quercus alba (20.6%) were the most important trees, with Liriodendron tulipifera (14.3%) also significant in the canopy. Juglans nigra [black walnut (16.0%)] was also found to be important in the canopy but was absent from the understory. Lands adjacent to the stand were at one time homesteads for farmers; the presence of J. nigra is likely due to naturalization from trees planted at the edge of the woods.

With the exception of Juglans nigra, the species composition is not unlike Quarterman and Keever's (1965) SMHF, as modified by Ware (1970) for the southeastern and central Virginia coastal plain. Some allowances for selective cutting must be made, however, in order to explain the abundance of Liriodendron tulipifera (small tree density of 36.6%) and Liquidambar styraciflua (9.8%) in the understory. Other small trees include F. grandifolia (24.4%), indicating that beech is reproducing well under the canopy, and Cornus florida (17.1%).

Other Shrubs and Herbs of Beech-Rich Uplands

In the spring, early flowering species such as Uvularia spp.

TABLE 14: Vegetational Data from Stand CS, a beech-white oak woodland on a north-facing slope.

Species	% Dominance	% Density		I.V.
		Large	Small	
Fagus grandifolia	15.8	27.3	24.4	21.6
Quercus alba	21.1	20.0	2.4	20.6
Juglans nigra	19.3	12.7	0	16.0
Liriodendron tulipifera	14.0	14.5	36.6	14.3
Nyssa sylvatica	7.0	7.3	0	7.2
Quercus velutina	8.8	3.6	0	6.2
Carya tomentosa	1.8	9.1	0	5.5
Liquidambar styraciflua	7.0	1.8	9.8	4.4
Pinus taeda	3.5	1.8	0	2.7
Ilex opaca	0	1.8	0	0.9
Ulmus americana	1.8	0	0	0.9
Cornus florida	0	0	17.1	0
Fraxinus americanus	0	0	7.3	0
Diospyros virginiana	0	0	2.4	0

TOTAL DENSITY:
Large trees: 438 trees/ha
Small trees: 326 trees/ha

TOTAL BASAL AREA:
32.7 m^2/ha

(bellworts) and Sanguinaria canadensis (bloodroot) are not uncommon along upland slopes. Luzula spp. (woodrushes) and Obolaria virginica (pennywort) may also be found in such locations. At the bottom of such slopes, along the broad flat swamp margins, Podophyllum peltatum (may-apple) is common. Leucothoe axillaris (dog-hobble) and L. racemosa (fetter-bush) are spring-flowering shrubs of slightly drier flats, as is Lyonia mariana (stagger-bush). Throughout the study area, the abundant Osmunda cinnamomea (cinnamon fern) and the less common Botrychium virginianum (rattlesnake fern) can be found sending out their fertile fronds. Symplocus tinctoria (sweet leaf), also common throughout, forms small yellowish blossoms in the spring, and small oddly-shaped berries in late summer. Pockets of Sphagnum moss and Arundinaria tecta (cane) dot the less dissected areas of these woods, frequently associated with seeps or intermittent streams. The cane especially enhances the southern flavor of the area, being found infrequently north of the James River.

Early summer-flowering herbs include Galax aphylla on steep slopes above swamps, while Chimaphilla maculata (spotted wintergreen) is conspicuous throughout the study area at this time. Dianthus armeria (Deptford pink) is frequent in less shaded spots. Later in the season, several members of the Orchidaceae can be found on broad upland flats, including Goodyera pubescens (rattlesnake plantain), Habenaria cristata (crested fringed orchid), H. clavellata (small green wood

orchid) and the common Tipularia discolor (crane fly orchid). Non-chlorophytic plants such as Monotropa hypopithys (pinesap), M. uniflora (Indian pipe), and Epifagus virginiana (beechdrops) are also frequent on the floor of these rich woods. Desmodium spp. (tick trefoils) and Uniola laxa are both abundant during the summer months, while Hexastylis virginica (heart-leaf ginger) and Mitchella repens (partridge berry) are year-long components of the forest floors.

Autumn brings the sporulation of many ferns, most visibly Onoclea sensibilis (sensitive fern), Lorinseria areolata (net-veined chain fern), and Botrychium dissectum (grapefern). Likewise, this season brings such shrubs as Euonymus americana (American strawberry bush), Ilex glabra (inkberry holly) and I. decidua (possumhaw holly) into fruit. Heterotheca spp. (golden asters), Aster spp., and Solidago spp. (goldenrods) are frequent fall flowers in many of the woods.

DISTURBED HABITATS

The intensive use of land in Isle of Wight has created large stretches of vegetated land which are highly disturbed. Three rather distinct groups of disturbed habitats can be identified readily: the edges of wooded areas, roadsides, and cleared fields. A large number of the species found in these habitats are introduced European or Oriental weeds and other exotics, many of which have become naturalized parts of the flora. Rather than

intensive description of the habitats, an attempt has been made to depict their general appearance through each season.

The dense vegetation at the edge of most woods forms a distinct community wherever it occurs. In the early spring, the rosaceous Amelanchier spp. (juneberry, serviceberry) and Aronia arbutifolia (chokeberry) are among the first trees to send out blossoms at the edge of many wooded plots. Spring-flowering Rubus spp. (blackberries and dewberries) form dense thickets at the entrance to almost every wooded stand, as do many species of Smilax. Cytisus scoparius (Scotch broom) blooms in late spring, followed by Sambucus canadensis (elderberry) a few weeks later, and then by Ligustrum sinense (privet). As summer progresses, the brightly colored fruits of Ailanthus altissima (tree of heaven) are abundant, as are the silky flowers of Albizia julibrissin (mimosa). In late summer and early fall, these edges are colored by the berries of Rhus copallina (winged sumac) and the nuts of Castanea pumila (chinquapin). These species are, of course, mixed in with the characteristic plants of the woods and with pines which grow in the more abundant light at the edge.

Soft roadside shoulders and drainage ditches provide an excellent habitat for many native and naturalized plants which require full sunlight. Houstonia spp. (bluets), Viola rafinesquii (field pansy), Lamium amplexicaule (henbit), Cerastium spp. (mouse-ear chickweeds), Poa spp. (bluegrasses), and several genera of the Brassicaceae are all among the earliest flowering plants in the spring. Senecio spp. (ragworts),

Gnaphalium spp. (cudweeds), Vicia spp. (vetches) and Trifolium spp. (clovers) then follow. Late spring and early summer herbs include Chaerophyllum tainturieri (chervil), Daucus carota (wild carrot), Achillea millefolium (yarrow), Erigeron spp. (fleabanes), Allium vineale (wild garlic), and Salvia lyrata (lyre-leaf sage). As summer progresses, Oenothera spp. (evening primroses), and Asclepias tuberosa (butterfly weed) are common. Many members of the Fabaceae are abundant at this time, particularly Desmodium spp. and Melilotus spp. (sweet clover), as well as Stylosanthes biflora (pencil flower) and Tephrosia spicata (the hoary pea). Mid-summer herbs such as Rhexia spp. (meadow beauties), Polygonum spp. (smartweeds and tearthumbs), Prunella vulgaris (self-heal), and Vernonia noveboracensis (ironweed) are common. Grasses such as Erianthus spp. (beard grasses) and Setaria spp. (foxtail grasses) are characteristic as well. Conspicuous late summer and autumn species include Helianthus spp. (sunflowers), Bidens bipinnata (Spanish needles), and Gentiana catesbaei (Catesby's gentian).

The cleared fields scattered throughout the area share many of the same species with the roadsides. Species more commonly associated with fields include Lespedeza spp. (bush clovers) and Rumex spp. (docks) in the early summer, and Apocynum cannabinum (Indian hemp), Asclepias spp. (milkweeds), Ipomoea spp. (morning glories), Datura stramonium (jimson weed), and Passiflora incarnata (passion flower) later in the season. Andropogon spp., including A. virginicus (broom sedge), are among the most common

grasses. Many sedges and rushes can be found in the puddles of the sandy soils of clear-cut and cultivated fields. Among these are rushes such as Juncus scirpoides and J. bulbosa, and sedges such as Eleocharis obtusa (spike rush), Cyperus spp., and Rhynchospora spp. Xyris difformis likewise occurs in such habitats. In drier sands, Diodia teres and D. virginiana (buttonweeds) are often found, as is Solanum carolinense (horse nettle). During the fall months, fields, as well as roadsides, are dominated by Eupatorium spp. (thoroughworts), Aster spp., and Solidago spp.

DISTRIBUTION OF RECORDS AND ANNOTATED CHECKLIST

Taxa Collected

In the course of this study, 603 species in 356 genera of 113 families have been documented by collections from the study area in western Isle of Wight County. Eighty-four of these species are herein reported from Isle of Wight County for the first time; three are new to the southeastern coastal plain of Virginia. Eleven species are considered extremely rare or rare (S1 or S2) by the Virginia Natural Heritage Program (Ludwig, 1989); three of these have not previously been documented from Isle of Wight. Four other species are considered rare to uncommon (S3) in Virginia (Ludwig, 1989). A summary of the taxa collected can be found in Table 15.

Phytogeographical Distribution of Species of Special Interest

Overall ranges of species given here are derived from Fernald (1950); distribution within Virginia from Harvill et al. (1986).

The species discussed below have been ranked "S1" by the Virginia Natural Heritage Program (Ludwig, 1989), signifying

that they are critically imperiled because of extreme rarity. Usually such taxa are known in Virginia from only five or fewer occurrences, and thus are often especially vulnerable to extirpation in the state.

Bulbostylis ciliatifolia (Ell.) Fernald, (Cyperaceae). Generally found in sandy pinelands and openings from Florida and Texas north to southeastern Virginia, Arkansas and Oklahoma, this sedge is at the northern limits of its range in the southeastern coastal plain of Virginia. Other locations in Virginia include the cities of Virginia Beach and Suffolk, and Sussex and Southampton Counties. In western Isle of Wight, it was found in an open sandy field.

Cenchrus incertus M. A. Curtis (Poaceae). This sand-bur, a species of open sandy soils, is at its northern limit in southeastern Virginia, extending west to Oklahoma and south to Florida and Texas. In the study, one small colony was found in the dry sandy soil along a roadside. Other locations in the southeastern Virginia coastal plain include the City of Suffolk and Southampton County.

Hypericum tubulosum Walter (Hypericaceae). This marsh St. John's-wort was found only once in the study area along a moist grassy path along a woodland border. In its overall range it is generally found in cypress and gum swamps from Florida and Louisiana north to southeastern Virginia, southern Ohio, southern Indiana, and Missouri. It is difficult to distinguish this species from the more common marsh St. John's-wort, H.

walteri, and there is some controversy as to the legitimacy of recognizing the two as distinct species. Hypericum tubulosum is at the northern limit of its range in southeastern Virginia, it is recorded from Isle of Wight County for the first time, an extension of its known range eastward from the counties of Southampton, Sussex, Greensville, and Louisa.

Sabatia brachiata Elliott (Gentianaceae). Found along a sandy path, this showy species generally occurs in dry to moist pinelands, oak woods, and clearings, from Florida to Louisiana north to southeastern Virginia, southern Indiana, and Missouri. It is recorded from Isle of Wight County for the first time, and has also been documented from the City of Virginia Beach, and the counties of Sussex and Prince George.

Zornia bracteata J. F. Gmelin (Fabaceae). Generally found in dry sandy woods and openings, as it was in this study, the range of this prostrate legume extends from Florida to Texas north to southeastern Virginia. It has also has been documented in Southampton and Henrico Counties, being at the northern extreme of its range in the Virginia coastal plain.

The following species have been ranked "S1S2", a category intermediate between the previous rank, and that which follows.

Carex lupuliformis Sartwell (Cyperaceae). Generally found in calcareous swamps, meadows, and prairies, from Vermont to Minnesota south to Connecticut, Virginia, Kentucky, Louisiana, and eastern Texas, the colony of this sedge found in this study

was in wet sandy soil in a clear-cut field. Distribution of this species in Virginia is not available for Virginia, as it is presently considered synonymous with Carex lupulina in the Atlas of the Virginia Flora (Harvill et al., 1986). Neither species has been found previously in Isle of Wight County.

Carya aquatica (Michaux f.) Nuttall (Juglandaceae). Three large mature water hickories were found in a partially flooded swamp, a habitat typical to this species. It ranges from the coastal plain of Florida to Texas north to Virginia, southwestern Illinois and southeastern Missouri. In Virginia, it has also been documented from the cities of Chesapeake and Sussex, and Southampton, Greensville, Surry, Matthews, and Middlesex counties.

The following species have been ranked "S2" by the Virginia Natural Heritage Program, being imperiled because of rarity. A taxon given this rank is usually known from only five to twenty occurrences in Virginia, and is susceptible to becoming endangered in the state.

Euphorbia ipecacuanhae L. (Euphorbiaceae). This highly variable spurge is found on dry sands, pinelands, and barrens, in the coastal plain and outer piedmont from Florida to New Jersey, and locally to Long Island. The one colony located in western Isle of Wight was found in a small sand hill community. In Virginia, this species has also been noted from the City of Suffolk and the counties of Southampton, Sussex, Greensville,

New Kent, Gloucester, and Caroline.

Kalmia angustifolia L. (Ericaceae). Sheep-laurel is found in old pastures and barrens from Labrador to Manitoba south to Nova Scotia, New England, South Carolina and Tennessee. This species was collected along the roadside woodland borders of the Blackwater Ecological Preserve, and thus does not necessarily represent a new location in western Isle of Wight County. Other locations in Virginia include the cities of Virginia Beach, Chesapeake and Suffolk, and the counties of Southampton, Caroline, Grayson, and Carroll.

Paronychia riparia Chapman (Caryophyllaceae). At the northern limit of its range, this perennial, mat-forming species is generally found along sandy shores, woodland borders, and sand hills from northern Florida and Alabama north to southeastern Virginia. In the present study, it was found along open sandy roadsides and fields. In the state as a whole, it has also been reported from Southampton and Sussex counties and the City of Virginia Beach.

Quercus laevis Walter (Fagaceae). Found typically in dry sandy woods and barrens, as it was in western Isle of Wight, turkey oak is at the northern extreme of its range in southeastern Virginia, whence it extends south to Florida and Louisiana. Other Virginia locations include only the cities of Virginia Beach and Suffolk, and Southampton County.

In addition, the following three species are considered rare or uncommon (between 20 and 100 occurrences) in Virginia, the first two being found only south of the James River (Harvill et al., 1986): Asimina parviflora, reported also in the City of Suffolk, and Southampton and Greensville counties; Carphephorus bellidifolius, found also in the City of Suffolk, and Southampton, Sussex, Greensville, and Brunswick counties; and Quercus incana, found also in the cities of Virginia Beach and Suffolk, Southampton and Sussex counties, and in one city north of the James, Hampton.

Regional and County Records

Three species have been recorded in the southeastern coastal plain of Virginia for the first time. Populus grandidentata (Salicaceae) is found in most of the northern counties of Virginia, but becomes progressively more infrequent in the coastal plain and piedmont as one travels south. The closest previously recorded location for this species is in Dinwiddie County to the west. Bidens aristosa (Asteraceae) has been previously recorded from James City County on the Virginia Peninsula, and from Matthews and Gloucester counties on the Middle Peninsula, but nowhere below the James. Its supposed absence in many areas may be attributable to the difficulty in

distinguishing it from an adventive species from the mid-West, B. polylepis, which has been identified from many counties throughout Virginia (G. W. Hall, personal communication). A third regional record, Celastrus orbiculatus, was found at the border of a cypress swamp behind the County Court House. It is uncertain whether this location represents a truly naturalized population or merely a persistent escape from cultivation. It is found above the James on the coastal plain, and only sparingly in the adjacent southern piedmont.

Four additional species were found beyond their previously known ranges in the southeastern coastal plain. They are listed below along with the direction of the range extension and the counties of other southside coastal locations: (1.) the range of Lycopodium tristachyum has been extended eastward from Sussex and Southampton counties. (2.) the range of Carex leptalea has been extended eastward from Prince George, Surry, and Southampton counties. (3.) Eragrostis curvula has been known previously in the southeastern coastal plain only from Prince George County, the western-most county of the region. (4.) Finally, the known range of Hypericum tubulosum, as mentioned above, has been extended eastward from Greensville, Sussex, and Southampton counties.

While the Blackwater Ecological Preserve proper was excluded from this study, the plants found there are part of the flora of the general area. To supplement the checklist, the

Appendix to this study lists species found in the Preserve, but not elsewhere in western Isle of Wight during this study. Notable species include Pinus palustris, P. serotina, and several species of Xyris (only X. difformis was recorded outside the Preserve). These species are all characteristic of southern pine barrens and sand hills. Also interesting is the presence of Asimina triloba and Carya glabra in the preserve, but their notable absence from the checklist of the present study, even though efforts were made to locate them. In addition, only after a long directed search could specimens of Pinus virginiana and Senecio aureus be found. The rarity or absence of these species, so abundant on the Peninsula of Virginia, may be due to geographical range limitations, as in Pinus virginiana, or the lack of specific habitat requirements within the study area.

Explanation of Annotated Checklist

In the annotated checklist that follows, regional records are indicated by three asterisks (***) preceding the entry, while the range extensions listed above are indicated by two asterisks (**). Other county records are preceded by only one asterisk (*). All entries list the species, authority, common name (if any), abundance and habitat within the study area, and the author's collection number. The abbreviation "I" following an entry indicates that the species has been introduced into the native flora.

Table 15: Summary of the Taxa.

PHYLUM	FAMILIES	GENERA	SPECIES
Lycopodiophyta	2	2	4
Polypodiophyta	7	13	15
Pinophyta	3	3	5
Magnoliophyta			
Liliopsida	15	76	147
Magnoliopsida	86	262	432
TOTAL	113	356	603

ANNOTATED CHECKLIST

LYCOPODIOPHYTA

LYCOPODIACEAE

Lycopodium appressum (Chapman) Lloyd & Underwood, Southern Bog Clubmoss. Rare; moist depressions in open sandy fields; (1200, 1230).

L. obscurum L., Tree Club Moss. Occasional; pine woodlands; (131, 437x).

**L. tristachyum Pursh, Ground-cedar. One colony in rich mixed woodlands; (965).

SELAGINELLACEAE

*Selaginella apoda (L.) Fernald, Meadow Spikemoss. One colony in moist open woods; (1160).

POLYPODIOPHYTA

ASPIDIACEAE

Athyrium asplenioides (Michaux) A.A. Eaton, Southern Lady Fern. Abundant; mixed woods and roadsides throughout; (567, 655, 696, 872).

Onoclea sensibilis L., Sensitive Fern. Common; mixed woods and roadsides throughout; (500).

Phegopteris hexagonoptera (Michaux) Fee, Broad Beech-fern. Occasional; mixed open woods; (927).

Polystichum acrostichoides (Michaux) Schott, Christmas Fern. Abundant; mixed upland wooded flats and slopes; (565, 695).

Thelypteris noveboracensis (L.) Nieuwland, New York Shield Fern. Common; mixed and pine woodlands; (664, 708).

ASPLENIACEAE

Asplenium platyneuron Nuttall, Ebony Spleenwort. Common; mixed woods and roadsides; (404, 568, 694).

BLECHNACEAE

*Anchistea virginica (L.) Presl, Virginia Chain Fern. Uncommon; mixed woods; (638).

Lorinseria areolata (L.) Presl, Net-veined Chain Fern. Common; mixed woods; (602).

OPHIOGLOSSACEAE

Botrychium dissectum Sprengel, Common Grapefern. Uncommon; moist woods; (605).

B. virginianum (L.) Swartz, Rattlesnake Fern. Uncommon; rich wooded slopes; (929).

OSMUNDACEAE

Osmunda cinnamomea L., Cinnamon Fern. Common; mixed woods and roadsides; (530, 666).

O. regalis L. var. spectabilis (Willd.) Gray, Royal Fern. Occasional; moist woods; (512, 666x).

POLYPODIACEAE

Polypodium polypodioides (L.) Watt, Resurrection Fern. Occasional; tree bases and crotches of upper branches in rich woods; (725).

PTERIDACEAE

*Dennstaedtia punctilobula (Michaux) Moore, Hay-scented Fern. One colony in mixed woods; (954).

Pteridium aquilinum (L.) Kuhn, Bracken Fern. Occasional; dry woods and roadsides; (531).

PINOPHYTA

CUPRESSACEAE

Juniperus virginiana L., Red Cedar. Common; open areas in dry woods; (586, 667, 691, 713, 742, 780).

PINACEAE

*Pinus echinata Miller, Short-leaf Pine, Yellow Pine. Common; sand hill communities and successional woods; (571).

P. taeda L. Loblolly Pine, Old-field Pine. Abundant; sand hills, successional woods, mixed uplands throughout; (717, 743).

P. virginiana Miller, Scrub Pine, Jersey Pine. Very uncommon; scattered sparsely in one shrubby successional area; (1193).

TAXODIACEAE

Taxodium distichum (L.) Richard, Eastern Bald Cypress. Common; flooded swamps and streams throughout; (636, 658).

MAGNOLIOPHYTA: LILIOPSIDA

ALISMATACEAE

Alisma subcordatum Raf., Common Water Plantain. Uncommon; flooded swamps and streams; (450, 492x).

Sagittaria longirostra (Micheli) J.G. Smith, Arrowhead, Duck Potato. One small colony at margin of flooded swamp; (510).

AMARYLLIDACEAE

Hypoxis hirsuta (L.) Coville var. hirsuta, Yellow Star Grass. Uncommon; moist woods, swamps, and streams; (363, 400).

*Narcissus pseudo-narcissus, Daffodil. Occasional; escaped to roadsides; (890, 901x). I.

ARACEAE

Arisaema triphyllum (L.) Schott, Jack-in-the-Pulpit. Common; swamps and moist woods; (205, 206).

Orontium aquaticum L., Golden Club. Several plants along a small open stream. (1213).

Peltandra virginica (L.) Schott & Endlicher, Arrow Arum. Uncommon; flooded streams; (451, 824x).

COMMELINACEAE

Commelina communis L., Dayflower. Occasional; moist roadsides; (750).

C. diffusa Burman f., Dayflower. Common; moist roadsides throughout; (606, 762, 1134).

*C. virginica L. Dayflower. One colony in moist intermittent streambed; (822).

Murdannia keisak (Hasskarl) Hand.-Mazz. One colony at margin of flooded swamp; (703). I.

Tradescantia virginiana L. Spiderwort. Uncommon; moist roadside ditches; (1132).

CYPERACEAE

Bulbostyis capillaris (L.) Clarke. Common; open fields and roadsides; (378, 478).

B. ciliatifolia (Ell.) Fernald. One colony in an open field; (646).

*Carex abscondita Mackenzie. One colony in rich moist woods; (971).

C. alata Torrey. Uncommon; moist woods and swamp margins; (207x).

C. amphibola Steudel. One colony in an open swamp margin. (973).

C. complanata Torrey & Hooker. Uncommon; roadsides and disturbed areas; (290).

*C. debilis Michaux. Uncommon; moist woods; (986).

C. folliculata L. Occasional; moist woods; (968, 984).

C. glaucescens Ell. Occasional; dry woods and fields; (559, 845).

C. intumescens Rudge. Common; moist woods; (392, 399, 816, 972).

C. joorii Bailey. Occasional; moist woods; (488, 815).

*C. laevivaginata (Kukenthal) Mackenzie. One colony in swampy stream bottom; (998).

*C. laxiculmis Schweinitz. One colony on richly wooded slope above swampy stream bottom; (995).

**C. leptalea Wahlenberg. One small colony among Sphagnum moss in swamp; (985).

*C. lupuliformis Sartwell ex Dewey. One colony found in wet sandy soil of clear-cut field; (384).

C. lurida Wahlenberg. Occasional; roadside ditches and moist woodland borders; (222).

C. nigromarginata Schweinitz. Occasional; open roadsides; (160, 898x).

*C. seorsa Howe. Occasional; moist swampy woods; (208, 966).

*C. striatula Michaux. One small colony on north facing-slope above swamp; (1125).

*C. styloflexa Buckley. One colony in swampy woods; (993).

C. sp. [C. albolutescens Schweinitz ?]. One colony at flooded swamp margin; (209).

Cyperus ovularis (Michaux) Torrey. Occasional; moist open fields; (381).

C. pseudovegetus Steudel. Common; moist open fields; (279, 289, 487, 846).

C. retrofractus (L.) Torrey. Occasional; moist low woods; (489).

C. retrorsus Chapman. Occasional; moist open fields; (647).

C. strigosus L. Common; roadsides; (517, 761).

*Dulichium arundinaceum (L.) Britton, Three Way Sedge. One small colony in low swampy woods; (989).

Eleocharis microcarpa Torrey, Spike Rush. Occasional; moist sandy soil in open fields; (840).

E. obtusa (Willd.) Schultes, Spike Rush. Common; moist sandy soil in open fields; (281, 841, 1156).

*Rhynchospora globularis (Chapman) Small, Beak Rush. Common; moist open fields; (269).

R. inexpansa (Michaux) Vahl, Beak Rush. Occasional; moist open fields; (844).

R. microcephala Small, Beak Rush. One colony along moist grassy path through thick pine woods; (537).

R. sp. [R. corniculata (Lam.) Gray ?], Beak Rush. Uncommon; moist open fields; (385).

Scirpus cyperinus (L.) Kunth, Wool Grass. Common; moist open fields; (418, 546).

DIOSCOREACEAE

Dioscorea batatas Dcne., Cinnamon Vine. Occasional; mixed woods; (953). I.

*D. villosa L., Wild Yam. Occasional; mixed swampy woods; (883, 967x).

IRIDACEAE

Iris virginica L., Blue Flag. Occasional; flooded swamps and streams, often emergent; (210, 1129).

Sisyrinchium angustifolium Miller, Blue-eyed Grass. Occasional; shaded roadsides and mixed woods; (193, 287, 1165).

S. arenicola Bicknell, Blue-eyed Grass. Occasional; shaded roadsides and mixed woods; (309, 963).

S. mucronatum Michaux, Blue-eyed Grass. One colony found along open roadside ; (202).

JUNCACEAE

Juncus acuminatus Michaux, Rush. Common; wet open sandy fields and roadside ditches; (280).

J. coriaceus Mackenzie, Rush. Common; moist roadside ditches; (456, 838).

J. debilis Gray, Rush. Common; wet open sandy fields and roadside ditches; (282, 842, 843).

J. dichotomus Ell. Rush. Common; open sandy fields and roadsides; (267, 839).

J. effusus L., Soft Rush. Common; wet open sandy fields and roadside ditches; (213, 283).

J. marginatus Rostk., Rush. Occasional; wet open sandy fields and roadsides; (849).

*J. platyphyllus (Weigand) Fernald, Rush. One colony in open sandy field; (268).

J. scirpoides Lam., Rush. Common; wet open sandy fields and roadsides; (281x, 342, 386, 848).

J. tenuis Willd., Path Rush. Common; roadsides, grassy paths and edges; (285).

*Luzula bulbosa (Wood) Rydberg, Woodrush. Occasional; sandy open fields and roadsides; (167, 177).

L. echinata (Small) Hermann, Woodrush. One colony on moist mixed wooded slopes; (924).

LEMNACEAE

*Lemna valdiviana Philippi; Duckweed. One colony floating on surface of flooded swamp; (1178).

Spirodela polyrhiza (L.) Schleiden, Duckweed. Occasional; floating aquatic on flooded swamps and ponds; (884x, 896).

*S. punctata (G.F.W. Meyer) Thompson, Duckweed. Occasional; floating aquatic on flooded swamps and ponds; (884). I.

LILIACEAE

Allium vineale L., Field Garlic. Common; roadsides and field edges; (252, 731). I.

Asparagus officinalis L., Asparagus. Occasional; weedy roadsides; (1179). I.

Hemerocallis fulva L., Day Lily. Occasional; escaped to roadsides; (278). I.

Medeola virginiana L., Indian Cucumber-root. Uncommon; moist woods; (605x).

Polygonatum biflorum (Walter) Ell., Solomon's Seal. Occasional; moist wooded slopes; (491).

Smilacina racemosa (L.) Desf., False Solomon's Seal. Common; moist woods and shaded roadsides; (244, 406).

Smilax bona-nox L., Greenbrier. Common; thick successional woods and woodland borders; (811).

S. glauca Walter, Sawbrier, Greenbrier. Common; thick successional woods and woodland borders; (744, 791).

*S. herbacea L., Carrion Flower. One colony in swampy woods; (987).

S. laurifolia L., Bamboo Vine, Laurel-leaf Catbrier. One colony in pine woodlands; (143).

S. rotundifolia L., Common Greenbrier. Common; mixed woods and woodland borders; (665, 706, 715).

S. sp. [*S. tamnifolia Michaux ?], Carrion Flower. One colony in swampy woods; (992).

*Uvularia perfoliata L., Bellwort, Strawbells. Occasional; moist wooded slopes; (923).

U. pudica (Walter) Fernald, Bellwort, Strawbells. One colony in dry pine woods; (146).

*U. sessilifolia L., Bellwort, Strawbells. One colony on moist wooded slope; (996).

Yucca filamentosa L., Bear-grass. One colony escaped at woodland border; (941).

ORCHIDACEAE

Cypripedium acaule Aiton, Pink Lady's Slipper. Locally common in heavy pine litter of pine woods; (300).

Goodyera pubescens (Willd.) R. Brown, Downy Rattlesnake Plantain. Occasional; moist woods; (458).

Habenaria clavellata (Michaux) Sprengel, Small Green Wood-Orchid. Uncommon; thick pine woods; (435).

H. cristata (Michaux) R. Brown, Crested Fringe Orchid. One small colony under canopy gap of mixed woods; (457).

Malaxis unifolia Michaux, Green Adder's Mouth. Uncommon; thick pine woods; (436, 867).

Tipularia discolor (Pursh) Nuttall, Crane-fly Orchid. Common; moist mixed woods (133, 439, 455, 490).

POACEAE

Agrostis perennans (Walter) Tuckerman, Upland Bentgrass. Uncommon; open sandy fields and roadsides; (241).

*Aira elegans Gaudin, Hair Grass. One colony along roadside; (249). I.

Andropogon glomeratus (Walter) BSP., Broom Sedge. One colony along broad roadside bordering pine-oak thicket; (894).

A. scoparius Michaux, Little Bluestem. Occasional; open fields and roadsides; (598, 795).

A. ternarius Michaux, Beard Grass. Occasional; roadsides; (763).

A. virginicus L., Broom Sedge. Common; open fields and broad roadsides; (785, 851).

Anthoxanthum odoratum L., Sweet Vernal Grass. Occasional; roadsides; (169, 211). I.

Aristida dichotoma Michaux, Three Awn Grass. Uncommon; open fields; (597).

Arthraxon hispidus (Thunb.) Makino. Uncommon; moist open areas; (745). I.

Arundinaria tecta (Walter) Muhl., Cane. Abundant; mixed woods and woodland borders; (603, 707, 915).

Arundo donax L., Giant Reed. One large colony along moist roadside; (766). I.

Cenchrus incertus M.A. Curtis, Sand Bur-grass. One small colony along sandy open roadside; (651).

Cinna arundinacea L., Wood Reed. Uncommon; moist woodland borders; (634).

Cynodon dactylon (L.) Persoon, Bermuda Grass. Common; grassy fields; (433). I.

Dactylis glomerata L., Orchard Grass. Common; woodland borders and roadsides; (1140). I.

*Danthonia sericea Nuttall, Oat Grass. Occasional; open pine woods and sandy fields; (243, 956).

D. spicata (L.) R. & S., Oat Grass. Uncommon; open sandy fields and roadsides; (288).

Dichanthelium aciculare (Poiret) G. & C. Occasional; moist open areas; (233).

D. acuminatum (Swartz) G. & C. Common; open dry sandy areas; (240, 347, 414, 621, 958).

D. boscii (Poiret) G. & C. Uncommon; dry thick pine woods; (444).

D. commutatum (Schultes) Gould. Occasional; mixed woods and open areas (402, 746).

D. dichotomum (L.) Gould. Common; moist open swamp margins; (313, 637, 784).

*D. oligosanthes (Schultes) Gould. Uncommon; dry sandy fields and roadsides; (236).

D. ravenelii (Scribner) Gould. One colony on wooded slope; (1167).

D. scoparium (Lam.) Gould. Occasional; moist roadsides; (318, 632).

D. sphaerocarpon (Ell.) Gould. Uncommon; shaded roadsides and woodland borders; (790).

Echinochloa crusgalli (L.) Beauvois, Barnyard Grass. Occasional; open fields; (442). I.

Eleusine indica (L.) Gaertner, Goose Grass. Occasional; roadsides; (518). I.

Elymus virginicus L., Wild Rye Grass. Common; roadsides; (311, 388x, 422, 599).

**Eragrostis curvula (Schrader) Nees, Weeping Love Grass. Occasional; roadsides; (358, 419, 612). I.

E. spectabilis (Pursh) Steudel, Tumble Grass, Purple Love Grass. Occasional; open fields and disturbed areas; (374, 463).

Erianthus contortus Ell., Plume Grass. Common; open fields and roadsides; (544, 759, 850, 864).

*E. giganteus (Walter) Muhl., Giant Beard Grass. One large colony along broad moist roadside; (870).

*Festuca elatior L., Fescue. Uncommon; open roadsides; (176, 181). I.

F. myuros L., Fescue. Uncommon; roadsides and open fields; (355). I.

F. obtusa Biehler, Fescue. Uncommon; thick low woods; (235).

Glyceria striata (Lam.) Hitchcock, Manna Grass. Common; moist low woods and swamp margins; (207, 298, 315).

Lolium perenne L., Rye Grass. Common; roadsides and woodland borders; (319x, 1137). I.

*Microstegium vimineum (Trinius) A. Camus. One colony in moist open area adjacent to stream; (771).

Miscanthus sinensis Anderson. Uncommon; roadsides; (836). I.

Panicum verrucosum Muhl., Panic Grass. Uncommon; open sandy fields; (674).

Phleum pratense L., Timothy. Occasional; weedy roadsides; (304). I.

Poa annua L., Low Speargrass. Common; roadsides and grassy fields; (171).

*P. autumnalis Ell., Bluegrass. Occasional; moist woods; (994).

P. pratensis L., Kentucky Bluegrass, Junegrass. Common; roadsides; (174).

*Secale cereale L., Rye. Uncommon; roadsides and fields; (289). A waif.

Setaria geniculata (Lam.) Beauvois, Foxtail Grass. Occasional; roadsides; (429, 629).

S. glauca (L.) Beauvois, Foxtail Grass. Occasional; roadsides; (394). I.

Sorghastrum nutans (L.) Nash, Indian Grass. One colony in open field near railroad tracks; (596).

Sorghum halepense L., Johnson Grass. Occasional; roadsides and open fields; (424). I.

Sphenopholis obtusata (Michaux) Scribner, Wedge Grass. Uncommon; open fields and roadsides; (237x).

*S. pensylvanica (L.) Hitchcock, Wedge Grass. One small colony along floodplain; (970).

Stipa avenacea L., Needle Grass. One colony in sandy pine woods; (983).

Tridens flavus (L.) Hitchcock, Purple Top. Common; roadsides; (669).

Uniola laxa (L.) BSP., Spikegrass. Common; woods and roadsides; (348, 408, 438, 533, 547, 611).

SPARGANIACEAE

Sparganium americanum Nuttall, Bur-reed. Occasional; streams and flooded swamps; (330, 1195).

TYPHACEAE

Typha latifolia L., Common Cattail. Occasional; moist open roadsides; (770, 847, 871x).

XYRIDACEAE

Xyris difformis Chapman, Yellow-eyed Grass. Uncommon; moist sandy depressions; (492, 535, 803, 881).

MAGNOLIOPHYTA: MAGNOLIOPSIDA

ACANTHACEAE

Justicia lanceolata (Chapman) Small, Water-willow. Occasional; margins of flooded swamps, often in large colonies; (362, 813).

Ruellia caroliniensis (Walter) Steudel, Hairy Ruellia. Occasional; open path and roadsides; (382x, 397).

ACERACEAE

*Acer negundo L., Box Elder, Ash-leaf Maple. One colony along abandoned railroad bed through open disturbed woods; (1148).

A. rubrum L., Red Maple. Abundant; swamps and low woods; (497, 577).

AIZOACEAE

Mollugo verticillata L., Carpet-weed. Occasional; roadsides and fields; (616). I.

ANACARDIACEAE

Rhus copallina L., Winged Sumac, Dwarf Sumac. Common; woodland borders; (590).

R. glabra L., Smooth Sumac, Common Sumac. Rare; woodland borders; (1152).

R. radicans L., Poison Ivy. Abundant; moist woods and roadsides throughout; (814).

*R. toxicodendron L., Poison Oak. One colony in dry sandy open pineland; (964).

ANNONACEAE

Asimina parviflora (Michaux) Dunal, Dwarf Pawpaw. One colony in open dry woods; (979).

APIACEAE

Chaerophyllum tainturieri Hooker, Chervil. Common; roadsides and open fields; (151, 184, 947).

*Cicuta maculata L., Water Hemlock. Uncommon; wet woodland borders and swamps; (1000, 1151).

Daucus carota L., Wild Carrot, Queen Anne's Lace. Abundant; weedy roadsides and open fields; (276, 469). I.

**Eryngium prostratum Nuttall. One colony in grassy field; (1176).

Hydrocotyle umbellata L., Marsh Pennywort. Common; emergent at margins of ponds, and in moist fields and ditches; (1202).

Ptilimnium capillaceum (Michaux) Raf., Mock Bishop's Weed. Occasional; weedy roadsides; (383, 395).

Sanicula canadensis L., Snakeroot. Occasional; mixed woods; (403, 933).

APOCYNACEAE

Apocynum cannabinum L., Indian Hemp. Common; weedy roadsides and open fields; (425).

Vinca minor L., Periwinkle. One colony in grassy field; (1175). I.

AQUIFOLIACEAE

Ilex decidua Walter, Possumhaw Holly. Occasional; low woods; (660, 879).

I. glabra (L.) Gray, Inkberry, Low Gallberry Holly. Common; low woods; (144, 526, 578, 800).

I. opaca Aiton, American Holly. Common; mixed woods throughout; (216).

I. verticillata (L.) Gray, Winterberry Holly. One colony in low moist woods adjacent to stream; (921).

ARALIACEAE

Aralia spinosa L., Devil's Walking Stick. Common; woodland borders and pine woods; (620).

ARISTOLOCHIACEAE

Aristolochia serpentaria L., Birthwort. Uncommon; rich moist woods; (932, 1162).

Hexastylis virginica (L.) Small. Heart-leaf Ginger. Common; mixed woods throughout; (604, 665x, 727).

ASCLEPIADACEAE

Asclepias amplexicaulis Smith, Milkweed. Occasional; roadsides and open fields; (415).

A. syriaca L., Common Milkweed. Common; roadsides and open fields; (423, 443).

A. tuberosa L., Butterfly Weed. Common; weedy roadsides; (326).

Matelea sp., Climbing Milkweed. One colony in disturbed open woods; (1167).

ASTERACEAE

Achillea millefolium L., Yarrow, Milfoil. Common; weedy roadsides and open fields; (221). I.

Ambrosia artemisiifolia L., Ragweed. Common; weedy roadsides and open fields; (555).

Antennaria plantaginifolia (L.) Richardson, Pussy-toes. Occasional; open grassy fields; (163).

Anthemis arvensis L., Corn Chamomile. Uncommon; open fields; (1131). I.

*Arnica acaulis (Walter) BSP., Leopard's Bane. One colony at edge of dry pine woods; (292).

Artemisia vulgaris L., Mugwort. Occasional; roadsides and fields; (641). I.

Aster lateriflorus (L.) Britton, Starved Aster. Occasional low woods and roadsides; (764).

*A. novi-belgii L., New York Aster. One colony along shaded roadside; (832).

A. pilosus Willd., Frost Aster. Common; roadsides and fields; (692, 758).

*A. simplex Willd. One colony in moist low woods; (812).

A. vimineus Lam. Uncommon; low woods; (877).

***Bidens aristosa (Michaux) Britton, Tickseed Sunflower. Common; moist swamp margins; (543, 672, 753, 783).

B. bipinnata L., Spanish Needles. Common; woodland borders, fields, and roadsides; (607).

*B. discoidea (T. & G.) Britton, Beggar Ticks. One colony found in moist swamp margin; (635).

B. frondosa L., Beggar Ticks. Occasional; moist swamp margins (699).

*B. tripartita L., Beggar Ticks. One colony found at margin of moist swamp; (699x). I.

Carphephorus bellidifolius (Michaux) T. & G. One colony in dry, open sandy woodland border. (1197).

Chrysanthemum leucanthemum L., Ox-eye Daisy. Common; roadsides and open fields; (260, 277, 1126). I.

Conoclinium coelestinum (L.) DC., Wild Ageratum. Occasional; moist roadsides; (690).

Coreopsis lanceolata L., Tickseed. Common; roadside ditches; (256, 357, 1133).

*C. verticillata L. Tickseed. One colony along shaded, moist, grassy path; (1218).

Eclipta alba (L.) Hasskarl, Yerba-de-Tago. Occasional; roadsides; (631).

Elephantopus carolinianus Willd., Elephant's Foot. Occasional; rich mixed woods; (1164).

E. nudatus Gray, Elephant's Foot. Occasional; scrubby pinelands; (534).

E. tomentosus L., Elephant's Foot. Occasional; mixed and pine woodlands; (486).

Erechtites hieracifolia (L.) Raf., Fireweed. Common; dry roadsides; (532, 724).

Erigeron annuus (L.) Persoon, Daisy Fleabane. Abundant; roadsides and open fields; (242x, 251, 262x, 521, 1130, 1136).

E. canadensis L., Horseweed. Common; roadsides and open fields; (420, 464, 467).

E. strigosus Muhl. ex Willd., Daisy Fleabane. Common; roadsides and open fields; (242, 1209).

*Eupatoriadelphus dubius (Poiret) K. & R., Joe-Pye Weed. One colony at edge of stream; (794).

Eupatorium capillifolium (Lam.) Small, Dog-fennel. Common; weedy roadsides and open fields; (757).

E. hyssopifolium L., Hyssop-leaf Thoroughwort. Occasional; open fields; (427, 671x).

E. pilosum Walter, Thoroughwort. Occasional; open fields; (341x, 551).

E. rotundifolium L. ssp. rotundifolium, Round-leaf Thoroughwort. Occasional; open fields and roadsides; (473, 545).

E. rotundifolium L. ssp. ovatum (Bigelow) M. & F. Occasional; open fields and roadsides; (338).

E. semiserratum DC., Thoroughwort. Common; open fields and roadsides; (413, 484, 549).

Galinsoga quadriradiata Ruiz & Pavon, Peruvian Daisy. One colony in grassy field at edge of swamp; (1170). I.

Gnaphalium obtusifolium L., Everlasting. Common; roadsides and open fields; (474).

G. purpureum L., Cudweed. Common; roadsides and open fields; (231, 286).

Helenium amarum (Raf.) Rock, Bitter-weed. Occasional; roadsides; 1169x.

Helianthus tuberosus L., Jerusalem Artichoke. One colony along roadside of farm; (754).

Heterotheca graminifolia (Michaux) Shinners, Golden Aster. Common; sandy fields, roadsides, and pinelands; (372x, 476, 963x).

H. mariana (L.) Shinners, Golden Aster. Common; sandy fields, roadsides, and pinelands; (576, 623, 670, 782, 885).

Hieracium gronovii L., Hawkweed. Common; roadsides and open fields; (479, 608, 722).

H. venosum L., Rattlesnake Weed. Occasional; dry sandy woods and borders; (203).

Hypochoeris radicata L., Cat's Ear. Occasional; roadsides; (219). I.

Krigia virginica (L.) Willd., False Dandelion. Common; open fields and roadsides; (138).

Lactuca canadensis L., Wild Lettuce. Common; roadsides, fields, and woodland borders; (366, 470).

Mikania scandens (L.) Willd., Climbing Hempweed. Occasional; moist borders and roadsides; (459).

Parthenium integrifolium L., Wild Quinine. Uncommon; roadsides and open fields; (272).

*Pluchea camphorata (L.) DC., Camphorweed. Occasional; wet open woodland borders; (502, 642).

Prenanthes serpentaria Pursh, Gall-of-the-Earth. One colony along sandy path of pinelands; (774).

Pyrrhopappus carolinianus (Walter) DC., False Dandelion. Common; roadsides; (396, 723).

Rudbeckia hirta L., Black-eyed Susan. Common; open fields and roadsides; (322, 1188).

Senecio anonymus Wood, Ragwort. Common; roadsides and fields; (175).

S. aureus L. Ragwort. One colony along floodplain of small a stream; (1227).

S. tomentosus Michaux, Ragwort. Common; roadsides and fields; (170, 180).

Sericocarpus asteroides (L.) BSP., White-topped Aster. Occasional; shaded roadsides and woods; (343).

Solidago bicolor L., Silver-rod. Uncommon; moist roadsides and woodland borders; (671).

S. caesia L., Wreath Goldenrod. Uncommon; moist wooded slopes; (735).

S. canadensis L., Goldenrod. Common; open woods and roadsides; (593, 755).

*S. juncea Aiton, Goldenrod. One colony along sandy path at border of successional pine woodland; (1191).

S. nemoralis Aiton, Goldenrod. Occasional; dry roadsides and fields; (548).

S. odora Aiton, Sweet Goldenrod. Common; pinelands and roadsides; (541, 556, 557, 575, 716, 981).

S. pinetorum Small, Goldenrod. Occasional; open fields and roadsides; (430, 558).

S. rugosa Miller, Goldenrod. One colony along weedy roadside; (720).

S. tenuifolium Pursh, Goldenrod. Common; open fields and roadsides; (595, 683, 756, 852).

Sonchus asper (L.) Hill, Spiny-leaf Sow Thistle. Common; roadsides and woodland margins; (262). I.

*Tagetes patula L., French Marigold. Escaped along roadside; (832x). A waif.

Taraxacum officinale Wiggers, Dandelion. Common; roadsides and fields; (220). I.

Vernonia noveboracensis (L.) Michaux, New York Ironweed. Occasional; moist open areas; (515, 765).

Xanthium strumarium L., Cocklebur. Occasional; open fields and roadsides; (835). I.

BALSAMINACEAE

Impatiens capensis Meerb., Spotted Jewelweed. Common; shaded swamp margins; (297).

BERBERIDACEAE

Podophyllum peltatum L., May-apple. Common, shaded floodplains; (299x, 934).

BETULACEAE

Alnus serrulata (Aiton) Willd., Common Alder, Smooth Alder. Occasional; moist woodland borders; (796).

Betula nigra L., River Birch. Common; edges of streams and swamps; (633).

Carpinus caroliniana L., Ironwood, American Hornbeam. Common; floodplains; (773).

Ostrya virginiana (Miller) K. Koch, Hop-hornbeam. Occasional; lowland flats; (793, 855).

BIGNONIACEAE

Bignonia capreolata L., Cross Vine. Common; borders and swampy margins; (188, 215).

Campsis radicans (L.) Seemann, Trumpet Vine, Trumpet Creeper. Common; borders throughout; (331).

BRASSICACEAE

Arabidopsis thaliana (L.) Heynhold, Mouse-eared Cress. Common; roadsides and fields; (135). I.

Barbarea verna (Miller) Ascherson, Early Winter Cress. Common; roadsides and fields; (168, 895, 1198). I.

*B. vulgaris R. Brown, Common Winter Cress, Yellow Rocket. One small colony along roadside; (229). I.

Capsella bursa-pastoris (L.) Medicus, Shepherd's Purse. Common; roadsides; (214). I.

Cardamine hirsuta L., Bitter Cress. Common; roadsides; (132). I.

C. pensylvanica Muhl., Bitter Cress. Occasional; roadsides; (945x, 1123).

Draba verna L., Whitlow-grass. Common; roadsides; (137). I.

Lepidium virginicum L., Poor-man's Pepper. Common; roadsides; (212, 947x).

Raphanus raphanistrum L., Wild Radish. Uncommon; roadsides and field margins; (265). I.

Rorippa palustris (L.) Besser, Yellow Cress. Locally abundant in wet open fields; (1153).

*Sibara virginica (L.) Rollins, Rock Cress. One colony in wet open field; (911).

Sisymbrium officinale (L.) Scopoli, Hedge Mustard. Uncommon; roadsides; (1138). I.

Teesdalia nudicaulis R. Brown, Shepherd's Cress. Common; roadsides and fields; (128). I.

CACTACEAE

Opuntia humifusa (Raf.) Raf., Prickly Pear. Locally common in open sandy soils of pinelands and disturbed areas; (809).

CALLITRICHACEAE

Callitriche heterophylla Pursh, Water Starwort. Occasional; submerged in or emergent from ponds and streams; (909).

CAMPANULACEAE

Lobelia cardinalis L., Cardinal Flower. Occasional; open swamp margins; (452, 498).

L. inflata L., Indian Tobacco. Uncommon; moist open areas; (644).

L. nuttallii R. & S., Lobelia. Occasional; open fields and roadsides; (270, 718).

L. puberula Michaux, Downy Lobelia. Occasional; open fields and roadsides; (550).

Triodanis perfoliata (L.) Nieuwland, Venus' Looking-glass. Common; roadsides, fields, and disturbed areas; (255).

CAPRIFOLIACEAE

Lonicera japonica Thunberg, Japanese Honeysuckle. Common; canopy openings in woodlands, borders, and roadsides; (253). I.

L. sempervirens L., Coral Honeysuckle. Occasional; woodlands and borders; (232).

Sambucus canadensis L., Elderberry. Common; woodland borders along roadsides; (263, 307, 901).

*Symphoricarpos orbiculatus Moench, Coralberry. One colony in open disturbed area along roadside; (828).

Viburnum nudum L., Viburnum. Uncommon; mixed woods; (914).

V. prunifolium L., Black Haw. Occasional; dry open woods; (918, 1141).

CARYOPHYLLACEAE

Agrostemma githago L., Corn Cockle. Occasional; roadsides; (197). I.

Cerastium glomeratum Thuillier, Mouse-eared Chickweed. Common; roadsides; (153). I.

C. semidecandrum L., Mouse-eared Chickweed. Occasional; roadsides; (1171). I.

Dianthus armeria L., Deptford Pink. Common; open disturbed areas; (302, 323x). I.

Lychnis alba L., White Cockle. One large colony on open sandy field; (1189). I.

Paronychia riparia Chapman, River Whitlow-wort. Occasional; sandy open fields and roadsides; (370, 412).

Sagina decumbens (Ell.) T. & G., Pearlwort. Occasional; roadsides; (156).

Saponaria officinalis L., Bouncing-bet. Occasional; open fields and roadsides; (421, 830). I.

Scleranthus annuus L., Knawel. Common; roadsides; (162).

Silene antirrhina L., Sleepy Catchfly. One colony along shaded roadside; (308).

Stellaria media (L.) Villars, Chickweed. Occasional; open grassy fields and roadsides; (1174). I.

CELASTRACEAE

***Celastrus orbiculatus Thunberg, Bittersweet. One large colony along swamp margin at edge of open grassy field; (1183). I.

Euonymus americanus L., Hearts-a-Bustin', American Strawberry Bush. Common; low woods and moist slopes; (237, 781, 900).

CHENOPODIACEAE

Chenopodium album L., Pigweed. Occasional; roadsides and fields; (833). I.

C. ambrosioides L., Mexican-tea. Occasional; roadsides and fields; (767). I.

CISTACEAE

Helianthemum canadensis L., Rockrose. Locally occasional in dry open pinelands; (238).

Lechea villosa Ell., Pinweed. Occasional; open sandy areas; (371).

CLETHRACEAE

Clethra alnifolia L., Sweet Pepperbush. Common; dry pinelands and borders; (345, 432, 505).

CONVOLVULACEAE

Cuscuta campestris Yuncker, Field Dodder. Occasional; woodland borders and roadsides; (321, 740).

C. compacta Jussieu, Compact Dodder. Occasional; woodland borders and roadsides; (537x).

Ipomoea coccinea L., Morning Glory. Occasional; roadsides and fields; (659). I.

I. lacunosa L., Small White Morning Glory. Common; roadsides and open fields; (628, 749, 792).

I. pandurata (L.) G.F.W. Meyer, Man-of-the-Earth. Occasional; roadside and fields; (661).

I. purpurea (L.) Roth, Common Morning Glory. Common; roadsides and open fields; (520, 751, 752). I.

Stylisma humistrata (Walter) Chapman, Breweria. Uncommon; roadsides and fields; (373).

CORNACEAE

Cornus florida L., Flowering Dogwood. Common; mixed upland woods; (562, 564x).

C. foemina Miller, Swamp Dogwood. Uncommon; rich swampy woods; (991).

CRASSULACEAE

*Penthorum sedoides L., Ditch Stonecrop. Uncommon; moist swamp margins; (508).

CURCURBITACEAE

Melothria pendula L., Creeping Cucumber. Occasional; disturbed woodland borders and roadsides; (600).

DIAPENSIACEAE

Galax urceolata (Poiret) Brummitt, Galax. Uncommon, though quite abundant on rich wooded slope above Rattlesnake Swamp off State Route 625; (227).

EBENACEAE

Diospyros virginiana L., Persimmon. Occasional; pine woodlands; (864x, 959).

ERICACEAE

Chimaphila maculata (L.) Pursh, Spotted Wintergreen. Common; wooded uplands throughout; (141).

Gaultheria procumbens L., Wintergreen. One colony in dry pine woods; (826).

Gaylussacia baccata (Wang.) K. Koch, Black Huckleberry. Common; dry pinelands; (980).

G. frondosa (L.) T. & G., Dangleberry. Common; dry pinelands; (195, 584).

Kalmia angustifolia L., Sheep Laurel. One colony along roadside of Zuni Preserve; (190).

Leucothoe axillaris (Lam.) D. Don, Dog-hobble. Common; flat mixed woods; (145, 248, 866).

L. racemosa (L.) Gray, Fetter-bush. Common; flat mixed woods; (191, 434, 827).

Lyonia ligustrina (L.) DC., Male-berry. One colony along open swampy stream; (1184).

L. mariana (L.) D. Don, Stagger-bush. Common; dry woods; (196, 1196).

Monotropa hypopithys L., Pinesap. Common; rich mixed woods; (296, 726x).

M. uniflora L., Indian Pipe. Common; rich mixed woods; (250, 454, 726).

Oxydendron arboreum (L.) DC., Sourwood. Common; mixed woods throughout; (356, 535x, 560, 580, 582x).

Rhododendron atlanticum (Ashe) Rehder, Dwarf Azalea. Occasional; moist areas in pine woods and borders; (201, 888).

R. periclymenoides (Michaux) Shinners, Wild Azalea. Common; mixed woodlands; (161, 905).

R. viscosum (L.) Torrey, Swamp Honeysuckle. Occasional; moist areas in pine woods; (324, 527).

Vaccinium arboreum Marshall, Sparkleberry. One group of shrubs at woodland border; (1146).

V. corymbosum L., Highbush Blueberry. Occasional; dry pine woods; (149, 967).

V. elliottii Chapman, Elliot's Bilberry. Occasional; dry pinelands; (417, 940, 988).

V. fuscatum Aiton, Black Highbush Blueberry. Occasional; dry pinelands; (940).

V. pallidum Aiton, Sweet Lowbush Blueberry. Occasional; dry pinelands; (962).

V. stamineum L., Deerberry. Common; dry pinelands; (200, 410).

V. tenellum Aiton, Slender Bilberry. Uncommon; dry pinelands; (246).

EUPHORBIACEAE

Acalypha gracilens Gray, Three-seeded Mercury. Occasional; roadsides and fields; (645, 772).

A. rhomboidea Raf., Three-seeded Mercury. Occasional; roadsides and fields; (627).

Cnidoscolus stimulosus (Michaux) Engelm. & Gray, Tread-Softly. Locally common in sandy pinelands; (477x).

Croton glandulosus L. var. septentrionalis Mueller-Aargau, Croton. Common; disturbed open areas; (440, 592, 1157).

Euphorbia cyanophora Murr., Painted-leaf. Open colony in small patch along roadside; (831). A waif.

E. ipecacuanhae L., Carolina Ipecac. Locally common in one sand hill pineland; (957).

E. maculata L., Upright Spotted Spurge. Common; roadsides and fields; (465, 622, 834).

*Tragia urens L., Stinging Tragia. Occasional; dry woods and open sandy areas; (411, 1190).

FABACEAE

Albizzia julibrissin Durazzini, Mimosa, Silktree. Occasional; woodland borders; (328). I.

*Amphicarpa bracteata (L.) Fernald, Hog-peanut. One colony covering shaded path; (1149x).

Cassia chamaecrista L., Large-flowered Sensitive Pea. Common; roadsides; (460).

C. nictitans L., Small-flowered Sensitive Pea. Common; roadsides; (617).

Centrosema virginianum (L.) Bentham, Spurred Butterfly Pea. Occasional; dry roadsides and sandy fields; (435).

Cercis canadensis L., Redbud. Uncommon; woodland borders; (904).

*Clitoria mariana L., Butterfly Pea. One colony in dry open sandy field; (416).

Cytisus scoparius (L.) Link, Scotch Broom. Common; roadsides; (327).

*Desmodium glabellum (Michaux) DC., Tick Trefoil. Occasional; open fields and roadsides; (566, 569).

D. nudiflorum (L.) DC., Naked-flowered Tick Trefoil. Occasional; rich woods; (405).

D. paniculatum (L.) DC., Tick Trefoil. Occasional; roadsides and fields; (591, 610).

*D. rotundifolium DC., Dollar-leaf. One colony in dry pine woods; (446).

Galactia regularis (L.) BSP., Milk-pea. Occasional; dry, sandy open fields; (372).

G. volubilis (L.) Britton, Twining Bush-clover. Occasional; dry sandy open fields; (475).

*Lathyrus hirsutus L., Wild Pea. One colony in open moist area near pond; (258). I.

*Lespedeza angustifolia (Pursh) Ell., Bush-clover. One colony in open field; (594, 805).

L. cuneata (Dumont) G. Don, Sericea, Bush-clover. Common; open fields and roadsides; (367, 466). I.

*L. hirta (L.) Hornemann, Bush-clover. Occasional; roadsides and fields; (350, 805).

*L. intermedia (Watson) Britton, Bush-clover. Occasional; open fields; (540).

L. repens (L.) Barton, Creeping Bush-clover. Occasional; roadsides; (656).

L. striata (Thunberg) H. & A., Japanese Clover. Common; roadsides and grassy fields; (685). I.

L. virginica (L.) Britton, Bush-clover. Occasional; open fields; (589).

Lupinus perennis L., Wild Lupine. Locally common in sandy open pinelands; (189).

Melilotus alba Desr., White Sweet Clover. Common; open fields and roadsides; (302x). I.

M. officinalis (L.) Lam., Yellow Sweet Clover. Common; open fields and roadsides; (259). I.

*Psoralea psoralioides (Walter) Cory, Sampson's Snakeroot. One colony in open field; (431).

Pueraria lobata (Willd.) Ohwi, Kudzu. Uncommon; woodland borders and roadsides; (882). I.

Stylosanthes biflora (L.) BSP., Pencil Flower. Occasional; shaded roadsides; (273, 657).

Tephrosia spicata (Walter) T. & G., Hoary Pea. Common; roadsides and dry open sandy soils; (274, 335, 375).

T. virginiana (L.) Persoon, Hoary Pea. One colony along dry border of pine woods; (1192x)

Trifolium arvense L., Rabbit-foot Clover. Common; roadsides; (226). I.

T. campestre Schreber, Low Hop Clover. Common; grassy roadsides; (223). I.

T. dubium Sibthorp, Low Hop Clover. Common; grassy roadsides; (228). I.

T. pratense L., Red Clover. Common; weedy roadsides; (173). I.

T. repens L., White Clover. Common; weedy roadsides; (218). I.

Vicia angustifolia Reichard, Common Vetch. Common; roadsides and farmland edges; (182, 257). I.

V. dasycarpa Tenore, Smooth Vetch. Common; roadsides and farm edges; (224, 951). I.

Wisteria sinensis (Sims) Sweet, Chinese Wisteria. Occasional; woodland borders; (165). I.

Zornia bracteata J.F. Gmelin. Uncommon; open sandy fields; (369, 808).

FAGACEAE

Castanea pumila (L.) Miller, Chinquapin. Occasional; woodland borders; (609, 807).

Fagus grandifolia Ehrhart, American Beech. Abundant; rich upland woods; (737).

Quercus alba L., White Oak. Abundant; rich upland woods; (686, 728, 788, 789, 797).

Q. coccinea Muenchh., Scarlet Oak. Occasional; rich upland woods; (688, 717x).

Q. falcata Michaux, Spanish Oak, Southern Red Oak. Abundant; upland woods throughout; (522, 529, 572, 652, 689, 868).

Q. hemisphaerica Bartram, Darlington's Oak, Laurel Oak (Upland). Occasionally locally common in dry sandy pinelands; (960).

Q. incana Bartram, Blue-jack Oak. One colony in scrubby woodland border; (687).

Q. laevis Walter, Turkey Oak. Uncommon; dry sandy pinelands; (654).

Q. laurifolia Michaux, Laurel Oak (Lowland). Occasional; moist swampy lowlands; (507, 787, 977).

Q. lyrata Walter, Overcup Oak. Occasional; wet swamp bottoms; (732).

Q. margaretta Ashe, Scrubby Post Oak. Occasional; dry open pinelands; (961).

Q. michauxii Nuttall, Basket-oak, Swamp-Chestnut Oak. Occasional; swamp margins and moist uplands; (817, 859).

Q. nigra L., Water Oak. Common; mixed woods and successional stands throughout; (581, 653, 680, 700, 712, 738, 798, 863).

Q. phellos L., Willow Oak. Common; moist woods; (582, 869, 881).

Q. sp. [*Q. shumardii Buckley ?], Swamp Red Oak. One sample collected from rich mixed upland woods; (885x).

Q. stellata Wang., Post Oak. Occasional; dry woods; (574).

Q. velutina Lam., Black Oak. Common; rich upland woods; (585, 714, 738x, 855x, 856x, 883x).

FUMARIACEAE

Fumaria officinalis L., Fumitory. One colony along moist shaded roadside; (946). I.

GENTIANACEAE

Bartonia virginica (L.) BSP., Yellow Bartonia. Locally common in dry pinelands; (437).

Gentiana catesbaei Walter, Catesby's Gentian. One colony along roadside; (860x).

Obolaria virginica L., Pennywort. One colony on rich wooded slopes; (936).

*Sabatia brachiata Ell., Rose Pink. One colony along sandy path; (354).

GERANIACEAE

Geranium carolinianum L., Cranesbill. Common; roadsides and open fields; (186, 944).

HALORAGACEAE

Myriophyllum aquaticum (Vell.) Verdc., Parrot-Feather. Occasional; flooded streams and ponds; (906). I.

Proserpinaca palustris L., Mermaid Weed. One colony in quite muddy, wet swamp bottom; (945).

P. pectinata Lam., Mermaid Weed. Occasional; flooded streams and ponds; (907, 908).

HAMAMELIDACEAE

Liquidambar styraciflua L., Sweetgum. Common; low woods, swamp margins and successional stands; (583, 711).

HYPERICACEAE

Hypericum gentianoides (L.) BSP., Pineweed. Common; open sandy fields and pinelands; (344, 426, 684).

H. hypericoides (L.) Crantz, St. Andrew's Cross. Common; open sandy fields and pinelands; (445, 778, 806, 854).

H. perforatum L., Common St. John's-wort. Occasional; weedy roadsides and woodland borders; (329). I.

H. punctatum Lam., Spotted St. John's-wort. Occasional; sandy fields and roadsides; (349).

**H. tubulosum Walter, Marsh St. John's-wort. One colony along grassy path at woodland border; (824).

H. virginicum L., Marsh St. John's-wort. One colony at flooded swamp margin; (779).

H. walteri Gmelin, Marsh St. John's-wort. One colony at margin of flooded swamp under opening in canopy; (501).

JUGLANDACEAE

Carya aquatica (Michaux f.) Nuttall, Water Hickory. Three mature trees in flooded swamp; (976).

C. pallida (Ashe) Engler & Graebner, Sand Hickory, Pale Hickory. Occasional; dry sandy pinelands; (786).

C. tomentosa (Poiret) Nuttall, Mockernut Hickory. Common; mixed upland woods; (563, 677, 729, 823, 857).

Juglans nigra L., Black Walnut. One stand of scattered trees in rich woods on north-facing slope above swamp; (926).

LAMIACEAE

Glecoma hederacea L., Ground Ivy. Occasional; grassy fields; (1172). I.

Lamium amplexicaule L., Henbit. Common; roadsides; (136). I.

Lycopus virginicus L., Bugle-weed. Occasional; moist roadsides and woods; (553, 721).

Monarda punctata L., Horsemint. One colony in dry sandy field; (676).

Perilla frutescens (L.) Britton. Occasional; weedy roadsides; (640). I.

Prunella vulgaris L., Self-heal, Heal-all. Common; roadsides throughout; (384x). I.

Pycnanthemum flexuosum (Walter) BSP., Mountain Mint. Occasional; open fields and weedy roadsides; (275, 481).

Salvia lyrata L., Lyre-leaf Sage. Common; roadsides throughout; (204, 382, 739).

Satureja nepeta (L.) Scheele, Basil-thyme. One colony along weedy roadside; (693). I.

*Scutellaria elliptica Muhl., Hairy Skullcap. Occasional; moist roadsides and rich moist woods; (404x, 1158).

S. integrifolia L., Skullcap. Occasional; moist roadsides and rich moist woods; (266, 1163).

LAURACEAE

Lindera benzoin (L.) Blume, Spicebush. Uncommon; swamp margins and moist woods; (506).

Sassafras albidum (Nuttall) Nees, Sassafras. Common; upland woods throughout; (140).

LENTIBULARIACEAE

*Utricularia inflata Walter, Bladderwort. One large colony in flooded stream; (1217).

U. sp. [not U. inflata], Bladderwort. One colony in flooded cypress swamp; (1177).

LINACEAE

Linum medium (Planchon) Britton var. texanum (Planchon) Fernald, Yellow Flax. One colony along roadside; (293).

L. striatum Walter, Yellow Flax. Occasional; along roadsides and open fields; (323, 1204).

LOGANIACEAE

Gelsemium sempervirens (L.) Aiton f., Yellow Jessamine. Occasional; dry pinelands and borders; (902).

Polypremum procumbens L. Occasional; roadsides; (462, 615).

LYTHRACEAE

Rotala ramosior (L.) Koehne, Tooth-cup. Locally abundant in one wet field; (1154).

MAGNOLIACEAE

Liriodendron tulipifera L., Tulip Tree, Tulip Poplar, Yellow Poplar. Common; upland woods throughout; (173x).

Magnolia grandiflora L., Southern Magnolia. Occasional; subcanopy of upland woods; (142, 164, 882x).

M. virginiana L., Sweet Bay. Common; upland woods throughout; (264, 504, 519, 536, 587).

MALVACEAE

*Abutilon theophrasti Medicus, Butter-press. One colony in logged field; (648). I.

MELOSTOMATACEAE

Rhexia mariana L., Meadow Beauty. Common; roadsides and open fields throughout; (337, 386x, 471, 524, 719).

R. virginica L., Meadow Beauty. One colony along roadside; (523).

MORACEAE

Broussonetia papyifera (L.) Vent., Paper Mulberry. Uncommon; woodland borders; (1173). I.

Morus rubra L., Red Mulberry. Occasional; moist woodland borders; (503, 820).

MYRICACEAE

Myrica cerifera L., Southern Bayberry, Wax-myrtle. Common; dry pinelands and borders throughout; (564, 662, 702, 799, 862, 886).

M. heterophylla Raf., Bayberry. One colony along border of mixed woods; (801).

NYSSACEAE

Nyssa aquatica L., Water Tupelo, Tupelo Gum. Common; partially flooded swamps; (511, 709).

N. sylvatica Marshall var. sylvatica, Black Gum. Occasional; upland woods and borders; (681, 837).

N. sylvatica Marshall var. biflora (Walter) Sargent. Abundant; swamps and stream bottoms; (988x).

OLEACEAE

Fraxinus americanus L., White Ash. Common; moist woods throughout; (494, 698, 710).

F. pennsylvanica Marshall, Green Ash. Only one specimen determined with certainty, though probably common in swamps, possibly along with F. caroliniana and F. tomentosa; (1182).

Ligustrum sinense Lour., Privet. Occasional; woodland borders; (261). I.

ONAGRACEAE

Circaea lutetiana (L.) A. & M. ssp. canadensis (L.) A. & M., Enchanter's Nightshade. Common; moist woods and swamp margins; (314).

Epilobium coloratum Biehler, Willow Herb. One colony along roadside; (516).

Ludwigia alternifolia L., Seedbox. Occasional; weedy roadsides and fields; (468).

*L. decurrens Walter, Water Primrose. One colony in wet soil of stream through logged field; (650).

Oenothera biennis L., Evening Primrose. Occasional; roadsides; (588, 769).

*O. fruticosa L., Sundrops. Occasional; grassy paths; (379, 480).

O. laciniata Hill, Cut-leaf Evening Primrose. Common; roadsides and grassy fields; (225).

OROBANCHACEAE

Epifagus virginiana (L.) Barton, Beech-drops. Occasional; rich upland woods; (601).

OXALIDACEAE

Oxalis corniculata L., Creeping Lady's Sorrel. Occasional; roadsides; (897). I.

O. dillenii Jacquin, Wood Sorrel. Occasional; roadsides; (192).

O. florida Salisbury, Wood Sorrel. Occasional; roadsides; (387x).

O. rubra Saint-Hilaire, Pink Wood Sorrel. One colony at woodland border along roadside; (398). I.

PAPAVERACEAE

Sanguinaria canadensis L., Bloodroot. Uncommon, though quite abundant in rich woods of north-facing slopes above Carrowaugh Swamp; (920, 928).

PASSIFLORACEAE

Passiflora incarnata L., Passion Flower, Maypops. Occasional; dry woodland borders and fields; (353).

PHRYMACEAE

Phryma leptostachya L., Lopseed. One colony in mixed woods; (407).

PHYTOLACCACEAE

Phytolacca americana L., Pokeweed. Common; weedy roadsides and fields throughout; (352, 359).

PLANTAGINACEAE

Plantago aristata Michaux, Bracted Plantain. Occasional; roadsides; (301).

P. lanceolata L., English Plantain. Common; roadsides; (178, 461, 951x). I.

P. rugelii Dcne., Plantain. Common; roadsides; (365).

P. virginica L., Hoary Plantain. Occasional; roadsides; (230).

PLATANACEAE

Platanus occidentalis L., Eastern Sycamore, American Planetree. Occasional; moist woods and swamps; (776).

POLEMONIACEAE

Phlox paniculata L., Summer Phlox. Occasional; weedy roadsides and fields; (829).

POLYGALACEAE

Polygala lutea L., Orange Milkwort. Occasional; heavy pine litter of dry sandy woodland borders; (325, 525).

P. mariana Miller, Milkwort. Occasional; roadsides and fields; (271, 336, 552).

POLYGONACEAE

Polygonum cespitosum (DeBruyn) Stewart, Tufted Smartweed. Uncommon; roadsides; (387). I.

P. cuspidatum Siebold & Zucc., Japanese Knotweed. Uncommon; woodland borders; (777). I.

P. hydropiper L., Common Smartweed. Uncommon; roadsides; (625).

P. hydropiperoides Michaux, Mild Water-pepper. Common; moist roadsides; (493, 626).

P. pensylvanicum L., Pinkweed. Common; moist roadsides; (554).

P. punctatum Ell., Water-smartweed. Occasional; roadside ditches; (360).

P. sagittatum L., Tearthumb. Occasional; moist roadsides; (624, 747).

P. setaceum Ell., Smartweed. Common; moist roadsides and open swamp margins; (483, 748, 874).

P. virginianum L., Jumpseed. Occasional; moist open floodplains; (730, 999).

Rumex acetosella L., Sheep-sorrel. Common; grassy roadsides and fields; (179, 1206). I.

R. conglomeratus Murray. Clustered Dock. Occasional; weedy roadsides and fields; (305).

R. crispus L., Yellow Dock. Occasional; weedy roadsides and fields; (351).

R. obtusifolius L., Bitter Dock. One colony along woodland border; (294).

PRIMULACEAE

**Lysimachia ciliata L., Fringed Loosestrife. Locally common along rich woods of north-facing slope; (1159).

**L. lanceolata Walter, Lance-leaf Loosestrife. Occasional; moist grassy paths; (390).

L. quadrifolia L., Whorled Loosestrife. One colony along sandy path at woodland border; (982).

RANUNCULACEAE

Clematis crispa L., Blue Jasmine. One large colony along moist grassy path; (391).

Ranunculus abortivus L., Kidney-leaf Crowfoot. Common; moist woods; (930, 949x).

R. bulbosus L., Buttercup. Common; roadsides; (185, 952). I.

*R. recurvatus Poiret. Occasional; moist woods; (217, 299, 929x).

R. sardous Crantz, Buttercup. Occasional; weedy roadsides and fields; (310, 942). I.

*Thalictrum pubescens Pursh, Meadow Rue. One colony in rich swampy stream bottom; (997).

RHAMNACEAE

Berchemia scandens (Hill) K. Koch, Supplejack. Uncommon; vine climbing above moist woods; (499).

ROSACEAE

Amelanchier canadensis (L.) Medicus, Juneberry. One colony along dry woodland border; (887).

A. obovalis (Michaux) Ashe, Coastal Juneberry. One colony in dry pinelands; (865).

A. spicata (Lam.) K. Koch, Running Juneberry, Shadbush. Occasional; woodland borders; (139, 887x).

Aronia arbutifolia (L.) Elliott, Chokeberry. Common; woodland borders; (148, 853, 893, 903).

Crataegus sp., Hawthorn. One colony along margin of flooded swamp; (974).

Duchesnea indica (Andrz.) Focke, Indian Strawberry. Occasional; grassy roadsides; (1147). I.

Geum canadense Jacquin, Avens. Occasional; moist woods; (931, 1150).

*G. virginianum L., Avens. One colony along shaded edge of abandoned railroad tracks; (1169).

*Malus pumila Miller, Common Apple. One tree in thick pine woods; (247). I.

Potentilla canadensis L., Cinquefoil. Common; roadsides and grassy fields; (159).

P. simplex Michaux, Cinquefoil. Occasional; roadsides and grassy fields; (912).

Prunus serotina Ehrhart, Black Cherry. Common; dry upland woods; (573, 579, 584x).

Rosa palustris Marshall, Swamp Rose. Common; swamp margins and moist borders; (303, 320, 339).

Rubus argutus Link, Blackberry. Occasional; woodland borders; (187).

R. cuneifolius Pursh, Blackberry. Occasional; woodland borders; (194, 340).

R. flagellaris Willd., Dewberry. Occasional; woodland borders; (291, 380).

R. sp. [*R. hispidus L. ?], Dewberry. Occasional; woodland borders; (939).

*Spiraea thunbergii Siebold, Bridal-wreath. One colony along roadside; (134). A waif.

RUBIACEAE

Cephalanthus occidentalis L., Button Bush. Occasional; open swamp and pond margins; (969, 1208).

Diodia teres Walter, Buttonweed. Common; dry paths and roadsides; (428, 538, 614).

D. virginiana L., Buttonweed. Common; roadsides and grassy fields; (361, 514).

Galium aparine L., Spring-cleavers, Goosegrass. Common; moist woods; (183, 950).

G. circaezans Michaux, Wild Licorice. Common; moist woods and ravine slopes; (401, 1143).

G. obtusum Bigelow var. obtusum, Bedstraw. Occasional; swampy woods; (234, 1199).

G. tinctorium L., Bedstraw. Common; moist woods; (317, 346).

G. triflorum Michaux, Sweet-scented Bedstraw. Occasional; moist woods; (925, 955).

*G. uniflorum Michaux, Bedstraw. Uncommon; moist woods; (639).

Houstonia caerulea L., Bluets, Quakerladies. Common; roadsides; (158).

*H. pusilla Schoepf, Dwarf Bluets. One colony along roadside; (129).

Mitchella repens L., Partridge Berry, Two-eye Berry. Common; upland woods throughout; (147).

Sherardia arvensis L., Field Madder. Occasional; grassy fields; (1180).

SALICACEAE

Populus alba L., White Poplar. Uncommon; weedy roadsides; (1194). I.

***P. grandidentata Michaux, Large-toothed Aspen. One tree in rich upland woods; (856).

P. heterophylla L., Swamp Cottonwood. One tree at flooded swamp margin; (975).

Salix babylonica L., Weeping Willow. One colony along moist woodland border; (768). I.

S. fragilis L., Crack Willow. One tree on swamp margin; (496). I.

S. nigra Marshall, Black Willow. Occasional; moist woodland borders; (701, 741, 899).

SAURURACEAE

Saururus cernuus L., Lizard's Tail. Common; swamp bottoms throughout; (312).

SAXIFRAGACEAE

Decumaria barbara L., Climbing Hydrangea. One colony of vines climbing above swamp; (697).

Heuchera americana L., Alumroot. One small colony in rich woods on north facing slope; (935).

Itea virginica L., Virginia Willow. One small colony at edge of small stream; (1124).

SCROPHULARIACEAE

Agalinis purpurea (L.) Pennell, Gerardia. Occasional; moist grassy roadsides; (673, 760).

Chelone glabra L., Turtlehead. Occasional; swampy bottomlands; (733, 773x).

Linaria canadensis (L.) Dumont, Toad-flax. Common; weedy roadsides and fields; (198, 239, 948).

Lindernia anagallidea (Michaux) Pennell, False Pimpernel. Occasional; moist fields and roadsides; (482, 1155).

Mecardonia acuminata (Walter) Pennell, Water-hyssop. Occasional; moist fields and roadsides; (485).

Mimulus alatus Aiton, Winged Monkey-flower. One colony in moist soil of swamp; (495).

Penstemon australis Small, Beard Tongue. One colony along sandy roadside; (1207).

P. laevigatus Aiton, Beard Tongue. Occasional; roadsides and woodland borders; (245).

Verbascum blattaria L., Moth-mullein. Common; weedy roadsides and fields; (1128). I.

V. thapsus L., Woolly Mullein. Common; weedy roadsides and fields; (409). I.

Veronica arvensis L., Corn Speedwell. Occasional; roadsides; (155). I.

V. peregrina L., Neckweed, Purslane-speedwell. Common; moist roadsides and fields; (910, 943).

SIMAROUBACEAE

Ailanthus altissima (Miller) Swingle, Tree-of-Heaven. Common; woodland borders; (334). I.

SOLANACEAE

Datura stramonium L., Jimson Weed. Uncommon; open fields; (477). I.

*Petunia x hybrida Vilm., Garden Petunia. One colony escaped to weedy roadside; (1189x). A waif.

Solanum americanum Miller, American Nightshade. Occasional; open fields; (649).

S. carolinense L., Horse Nettle. Common; weedy roadsides, fields, and woodland borders throughout; (295, 913).

SYMPLOCACEAE

Symplocos tinctoria (L.) L'Her., Sweetleaf, Horse-sugar. Common; woodlands and borders throughout; (613, 678, 825, 878, 917).

ULMACEAE

Celtis occidentalis L., Hackberry. One colony along woodland border; (1144).

*Ulmus alata Michaux, Winged Elm. Occasional; moist woodlands and open areas; (513, 817x, 1127).

U. americana L., American Elm. Common; moist lowlands; (860, 861, 880).

URTICACEAE

Boehmeria cylindrica (L.) Swartz, False Nettle. Common; moist lowlands; (472).

Pilea pumila (L.) Gray, Clearweed. One colony along stream in moist lowlands; (873).

VALERIANACEAE

Valerianella locusta (L.) Betcke, Cornsalad. One colony along roadside; (154). I.

V. radiata (L.) Dufr. var. radiata. Cornsalad. Occasional; roadsides; (949).

V. radiata (L.) Dufr. var. fernaldii Dyal. Occasional; roadsides; (199).

VERBENACEAE

Callicarpa americana L., Beauty Berry, French Mulberry. Occasional; moist woodland borders; (775).

Verbena urticifolia L., White Vervain. One colony in open gravelly field; (368).

VIOLACEAE

Viola sororia Willd., Woolly Blue Violet. Occasional; wooded slopes and roadsides; (152, 166, 891, 898, 937, 938).

V. triloba Schweinitz, Violet. One colony in swamp bottom; (978).

V. primulifolia L., Primrose-leaf Violet. Occasional; moist swampy woods and roadsides; (157, 922).

V. rafinesquii Greene, Wild Pansy. Common; roadsides and fields; (130, 889).

VITACEAE

Parthenocissus quinquefolia Planchon, Virginia Creeper. Common; woodlands and borders throughout; (819, 1203).

Vitis aestivalis Michaux, Summer Grape. Common; woodland borders; (509).

V. rotundifolia Michaux, Muscadine, Scuppernong. Common; woodlands and borders throughout; (570, 679).

APPENDIX

Plants of the Blackwater Ecological Preserve (Frost and Musselman, 1987) which were not found elsewhere in western Isle of Wight in this study. Entries enclosed in brackets ([]) indicate species found by Fernald but not by Frost and Musselman. Authorities follow Frost and Musselman (1987).

EQUISTOPHYTA:

EQUISETACEAE: *Equisetum hyemale* L.

LYCOPODIOPHYTA:

LYCOPODIACEAE: *Lycopodium flabelliforme* (Fernald) Blanch.

POLYPODIOPHYTA:

OPHIOGLOSSACEAE: *Botrychium biternatum* (Sav.) Underwood.

PTERIDACEAE: *Adiantum pedatum* L.

SCHIZAEACEAE: *Lygodium palmatum* (Bernh.) Swartz.

PINOPHYTA:

PINACEAE: *Pinus palustris* Miller. *P. serotina* Michaux.

MAGNOLIOPHYTA: LILIOPSIDA:

CYPERACEAE: *Carex caroliniana* Torrey. *C. physorhyncha* Liebmann. *C. stricta* Lam. *Cyperus filiculmis* Vahl. *C. ovularis* (Michaux) Torrey. *C. polystachyos* var. *texensis* (Torrey) Fernald. [*Liphocarpha maculata* (Michaux) Torrey.] *Rhynchospora capitellata* (Michaux) Vahl. *R. debilis* Gale. [*R. fascicularis* (Michaux) Vahl.]

IRIDACEAE: *Iris verna* L. *Sisyrinchium albidum* Raf.

JUNCACEAE: *Juncus abortivus* Chapman. *J. repens* Michaux. *Luzula acuminata* Raf. *L. multiflora* (Retzius) Lej.

LILIACEAE: *Smilax auriculata* L. *S. walteri* Pursh. [*Zigadenus glaberrimus* Michaux.]

ORCHIDACEAE: [*Habenaria blephariglottis* (Willd.) Hooker.] *H. ciliaris* (L.) R. Brown. *Orchis spectabilis* L. *Spiranthes cernua* (L.) Richard.

POACEAE: Aristida curtissii (Gray) Nash. [A. virgata Trinius.] Cenchrus longispinus (Hackel) Fernald. Panicum commonsianum Ashe. P. hians Ell. [P. lancearium Trinius.] P. laxiflorum Lam. Paspalum setaceum Michaux. Triplasis purpurea (Walter) Chapman.

XYRIDACEAE: [Xyris ambigua Beyrich.] X. caroliniana Walter. X. jupicai Richard.

MAGNOLIOPHYTA: MAGNOLIOPSIDA:

ANNONACEAE: Asimina triloba (L.) Dunal.

APOCYNACEAE: Amsonia tabernaemontana Walter.

ASCLEPIADACEAE: Asclepias vareagata L.

ASTERACEAE: Aster puniceus L. Carphephorus tomentosus (Michaux) T. & G. Erigeron pulchellus Michaux. Eupatorium serotinum Michaux. Heterotheca gossypina (Michaux) Shinners. H. nervosa (Willd.) Shinners. Liatris graminifolia (Walter) Willd. [Silphium compositum Michaux.] Solidago erecta Pursh.

BETULACEAE: Corylus americana Walter.

CALYCANTHACEAE: Calycanthus floridus L.

CAMPANULACEAE: [Lobelia elongata Small.] L. spicata Lam.

CAPRIFOLIACEAE: Viburnum acerifolium L.

CARYOPHYLLACEAE: [Arenaria caroliniana Walter.]

CISTACEAE: Lechea leggettii Britton & Hollick.

CONVOLVULACEAE: Calystegia sepium (L.) R. Brown. Cuscuta pentagona Engelm.

CORNACEAE: Cornus amomum Miller.

DIAPENSIACEAE: Pyxidanthera barbulata Michaux.

ERICACEAE: Epigaea repens L. Gaylussacia dumosa (Andrz.) T. & G.

EUPHORBIACEAE: Euporbia ammannioides HBK.

FABACEAE: Apios americana Medicus. [Crotalaria angulata Miller.] [Desmodium tenuifolium T. & G.] Lespedeza capitata Michaux.

FAGACEAE: Quercus rubra L.

GENTIANACEAE: Sabatia calycina (Lam.) Hell.

HYPERICACEAE: Hypericum mutilum L.

HYDROPHYLLACEAE: Hydrolea quadrivalvis Walter.

JUGALNDACEAE: Carya glabra (Miller) Sweet.

LAMIACEAE: Trichostema dichotomum L.

LAURACEAE: Persea borbonia (L.) Spreng.

LENTIBULARIACEAE: Utricularia gibba L. U. subulata L.

LORANTHACEAE: Phoradendron serotinum (Raf.) M. C. Johnson.

OLEACEAE: Chionanthus virginicus L. Fraxinus caroliniana Miller.

PASSIFLORACEAE: Passiflora lutea L.

POLYGONACEAE: Polygonella polygama (Vent.) Engelm. & Gray.

PORTULACACEAE: Claytonia virginica L.

RANUNCULACEAE: Aquilegia canadensis L. Ranunculus laxicaulis (T. & G.) Darby.

ROSACEAE: [Agrimonia pubescens Wallr. var. microcarpa (Wallr.) Ashe.] A. rostellata Wallr. Aruncus dioicus (Walter) Fernald.

RUBIACEAE: Oldenlandia uniflora L.

SALICACEAE: Populus deltoides Marshall. Salix caroliniana Michaux.

SANTALACEAE: Comandra umbellata (L.) Nuttall.

SARRACENIACEAE: [Sarracenia flava L.] S. purpurea L.

SCROPHULARIACEAE: Agalinis tenuifolia (Vahl) Raf. Aureolaria virginica (L.) Pennell. Gratiola pilosa Michaux. G. virginica L. Micranthemum umbrosum (Walter) Blake. Seymeria cassioides (Walter) Blake.

VITACEAE: Vitis riparia Michaux.

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